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"CONSERVATION OF WILD LIFE THROUGH EDUCATION."

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DISEASES OBSERVED IN GAME BIRD RAISING*

By H. VAN ROEKEL

(With seven photographs by the author)

Game bird raising is becoming more extensive through the increased interests of those who realize and feel that game birds have a commercial and aesthetic value. The operation and management of a game farm is by no means free from discouraging difficulties. Such phases

* Contribution No. 5 from the Game Laboratory, George Williams Hooper Foundation for Medical Research, University of California, San Francisco.

as feeding, selection and mating of breeders, hatching, brooding and rearing of chicks, all require a thorough understanding of what is necessary for game birds. In many respects, poultry management may be applied to game bird raising. However, there are certain fundamental important differences that one should not overlook. Experienced game bird breeders should be consulted on these phases.

In establishing a game farm, one often neglects to consider the sanitary aspects which may later cause disease outbreaks. It is less difficult to prevent diseases than to control or eradicate them. One should attempt to provide for ample space, practice a rotation system of pens, and install equipment which can be readily cleaned and disinfected.

Probably one of the greatest sources of disease is brought in through the employment of domestic hens for hatching and brooding. These birds are often selected at random and they may be infested with parasites or other diseases that are transmissible to game birds. Artificial incubation and brooding will do away with this danger to a large extent. Several breeders have found artificial incubation and brooding quite successful, and they feel that it will become the practical method for raising game birds. It will increase the production at less cost. However, one should guard against sacrificing sanitary and hygienic measures for the sake of a large production. For instance, overcrowding should be avoided and the rotation of pens should be practiced.

During the past year, several diseases were observed in game birds raised in captivity. More trouble was experienced among the young birds than the mature birds.

COCCIDIOSIS

Coccidiosis is an infectious disease caused by a micro-organism which is found in the digestive tract. Investigators have reported this parasite to be present in chickens, geese, ducks, pheasants, grouse, turkeys, quail and other game birds. Different strains of coccidia have been identified among the organisms isolated.

An outbreak among young pheasants was observed at one of the game farms. The disease was first diagnosed in pheasants two and a half weeks old. A mortality of approximately 25 per cent was experienced within eight days. The infected chicks revealed a droopiness, slight diarrhea, loss of appetite and general weakness. These symptoms were observed only a short time prior to death. Autopsy revealed a slight congestion of intestines, contents fluid, and cecal contents dark in color and of dry consistency. Smears from any portion of the intestinal tract would contain coccidia. From the history obtained it was learned that a 35 per cent mortality had occurred in six to eight weeks' old pheasants which had previously occupied the same pens. Later coccidiosis broke out in several pens of fifteen-day-old pheasants. An examination of the birds in general revealed that the infection had disseminated through the entire premises. Since domestic birds were employed for hatching and brooding, it is likely that the infection gained entrance through that source. The hens had been purchased from small poultry flocks in which one often finds disease. Due to lack of space and facilities, isolation methods could not be carried out. After the rearing

season when the pens were vacated, the ground was rested, thoroughly cleaned, plowed and seeded with grain and kale. The pens were rested approximately six months. During the 1929 season the disease has not been observed on this farm. Artificial incubation and brooding will be an aid in combating this disease in game-bird raising.

One duck club reported a heavy loss among young mallard ducks. Laboratory examination revealed a heavy infection with coccidia. An acute inflammation of the eyes existed, together with marked secretion. An accumulation of thin pus was observed in cases where eyelids were glued together.

In one adult quail, coccidiosis was responsible for death. The bird manifested a droopiness, ruffled feathers, drowsiness and general weakness. Death occurred four days after the first symptoms were observed. Post-mortem examination revealed the small intestine and ceca to be distended with gas and food. The liver was slightly congested. Intestinal smear revealed large numbers of coccidia.

BLACKHEAD

This disease was observed in wild turkey poults and one adult quail. It is caused by a parasitic micro-organism which may be found in the liver and intestines. According to certain investigators the cecal worm and cecal worm eggs play a role in the transmission of the causative organism. Birds may pick up the infection from the soil, feed and water which has been contaminated by droppings of infected birds.

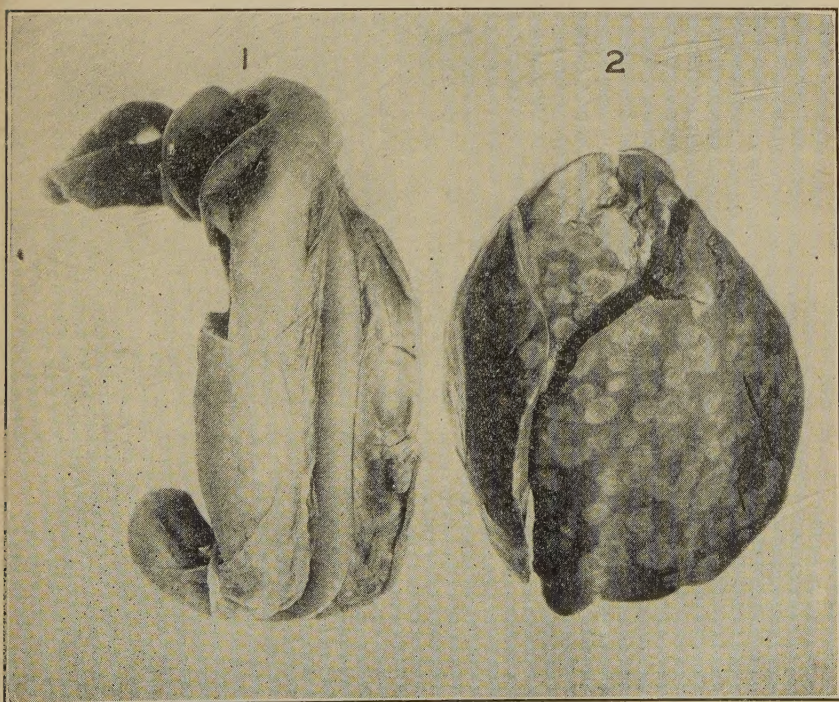


FIG. 90. Blackhead lesions in liver and caeca of wild turkey.
(1) Enlarged caeca. (2) Liver.

Young birds (four weeks to six months old) are most susceptible. The greatest mortality occurs during this age. A mortality of approximately 10 per cent was experienced in the turkeys. The birds were raised with domestic hens. When eight to ten weeks old, the hen was removed from the pen. No open range or rotation system was practiced to control the disease. The lesions were limited to the intestinal tract and liver. Circumscribed yellowish-gray depressed areas were found on the liver. The walls of the ceca or blind pouches were thickened with lining often necrotic and foul smelling. As yet no successful treatment has been established in the control of blackhead. Artificial hatching and brooding, followed by rearing on clean ground with frequent rotations may prove successful.

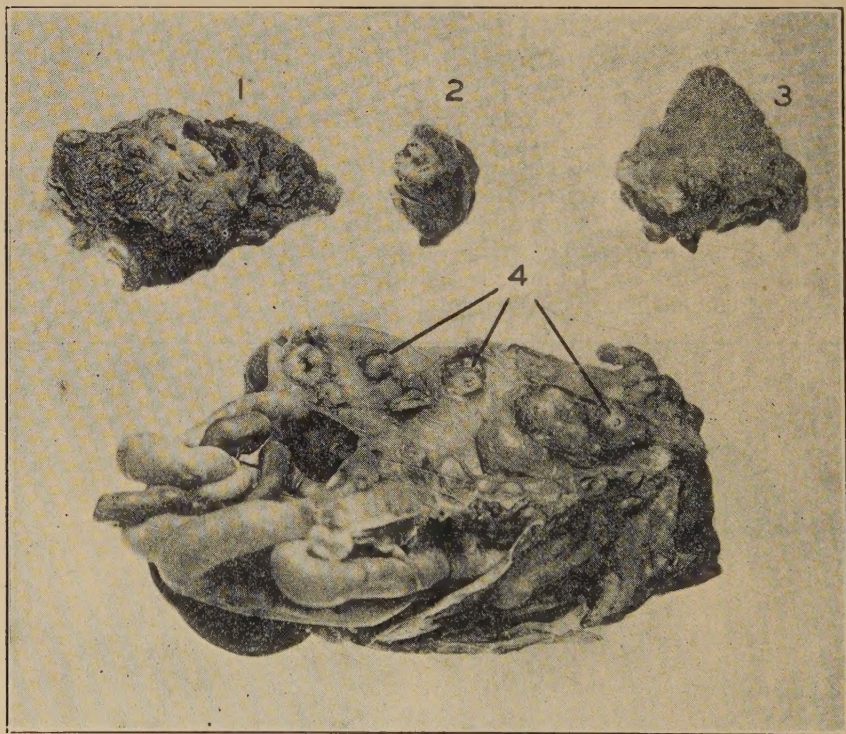


FIG. 91. Internal organs of pintail duck affected with *Aspergillosis*. (1) Lung. (2) Kidney. (3) Heart. (4) Mold colonies on peritoneum of abdominal organs.

ASPERGILLOSIS *

This disease was observed in wild pintail ducks held in captivity. In this case, it was caused by *Aspergillus fumigatus*, commonly known as mold infection. This variety of mold is common in nature, but not all strains are pathogenic. It may be picked up with the feed, water, soil and even from the air. The mortality in this case was rather heavy. In certain birds, death was due to secondary infection with bacteria.

* The species of *Aspergillus fumigatus* was identified by Charles Thom, mycologist, Bureau of Chemistry and Soils of the United States Department of Agriculture, to whom we feel greatly indebted.

The spores of the mold enter the respiratory tract and may pass to the air sacs. In heavy infection, the pathological changes are extensive involving the lungs, liver, intestines, kidney, peritoneum and sometimes the heart. In most specimens, the lungs were greatly affected. Grayish-

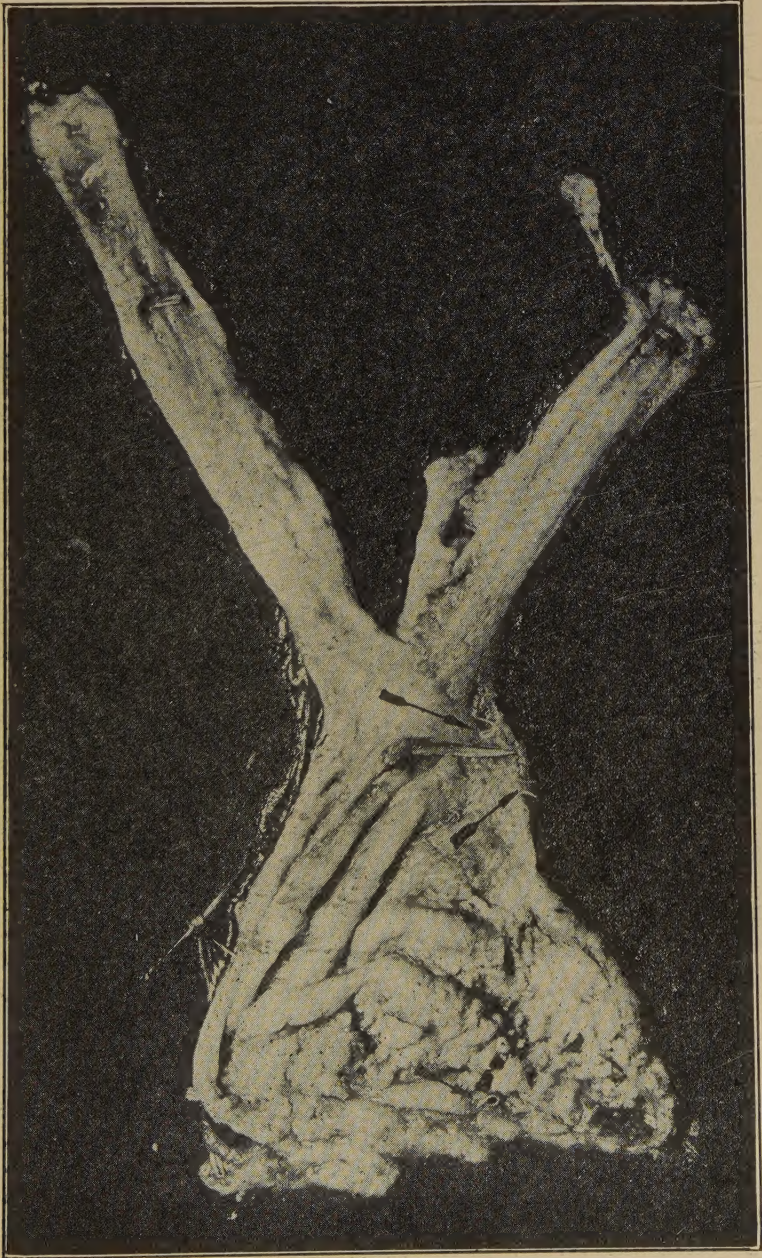


FIG 92. Crop of California valley quail infested with *Capillaria contortum*. Note thick fibrous lining. Arrows point to worms. Enlarged 1.5 X.

white mold colonies were found on the air-sac walls, in the bronchi, bronchioles and lung tissue. The symptoms manifested were drowsiness, a tendency to sit down, retraction of head and neck, loss of appetite, difficult respiration and general weakness. Death occurred two to three days after first symptoms were observed.

The disease was controlled in a short time after the birds had been moved to a clean pen with uncontaminated feed and water.

Aspergillosis was observed in two pintail ducks in nature while investigating duck sickness last fall. Both specimens were generalized cases.



FIG. 93. *Capillaria contortum* removed from the crop lining of California valley quail. Slightly enlarged.

NEMATODE INFESTATION*

A small threadlike worm, *Capillaria contortum*, found interwoven in the lining of the crop may be responsible for mortality in quail. Birds infested with this parasite manifest a general physical disturbance, loss of weight, and general weakness. This parasite when present in large numbers causes great destruction to the mucous lining and underlying structures. A thick, white, rough membrane forms on the crop lining which interferes with the function of the organ. The structure

* This worm was identified by the Zoological Division, Bureau of Animal Industry, United States Department of Agriculture, to whom we wish to extend our thanks.

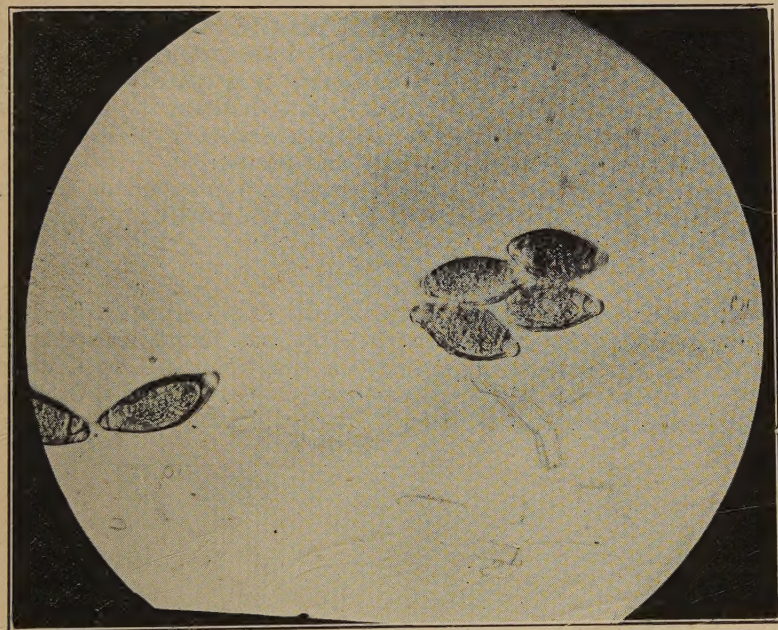


FIG. 95. Eggs of the cropworm (*Capillaria contortum*).
Enlarged 325 X.

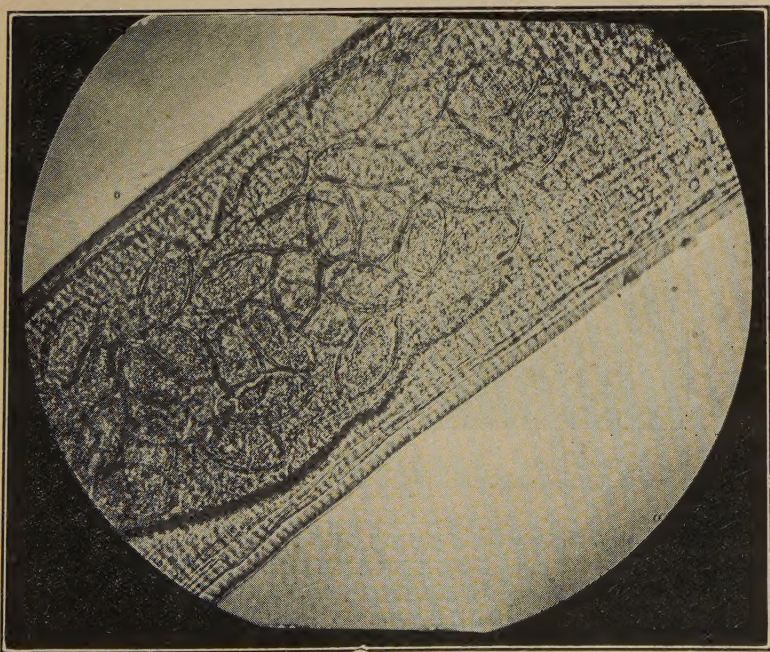


FIG. 94. Portion of cropworm filled with eggs.
Enlarged 325 X.

of the mucous lining proper is greatly altered. The worms can be extracted from the lining with a pair of forceps. In heavily infested cases the mucous membrane is almost solidly interwoven with the small, threadlike worms. Large numbers of double operculated eggs may be found in the intestinal contents. Little is known about the life history of this parasite. Other capillarids have been reported to be of pathological significance in chickens, turkeys and grouse.

Intestinal round worms and cecal worms are quite common in game birds and may lower their resistance and general health.

MISCELLANEOUS

Tuberculosis has been observed in wild turkeys but other birds appear to be less susceptible. One silver pheasant was found infested with air-sac mites. Symptoms were reported as sluggishness, loss of weight and general weakness. No gross lesions were observed and it is doubtful whether the mites were the direct cause of death.

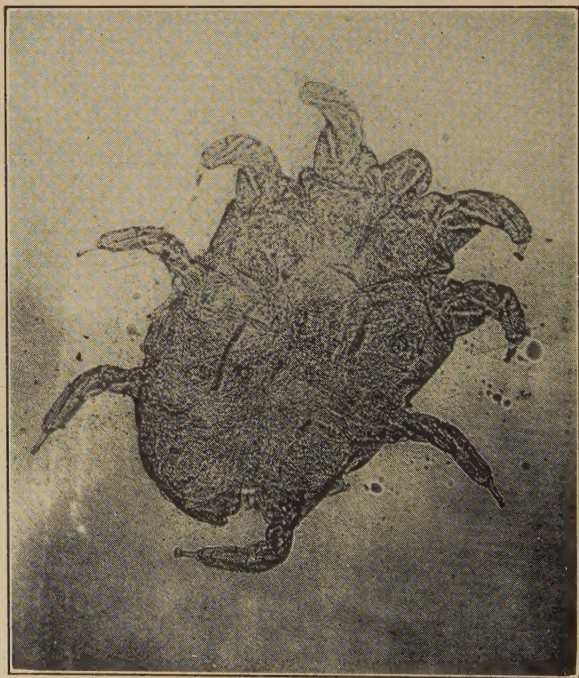


FIG. 96. Air-sac mite (*Cytolcichus nudus*) found in abdominal air-sac of silver pheasant. Ventral view. Enlarged 105 X.

Quail are frequently infested with head lice. Large numbers of eggs may be found attached to head feathers. They may not be the primary cause of disease but may be a predisposing factor.

The prevention, control and treatment of diseases in game birds is similar to that of poultry. In case disease troubles arise specimens should be sent to the laboratory for diagnosis and treatment given according to diagnosis.

PARASITISM IN DEER *

By H. VAN ROEKEL

(With six photographs by the author)

According to past records concerning deer mortalities in California, it is evident that parasitic infestation is of some significance. Numerous

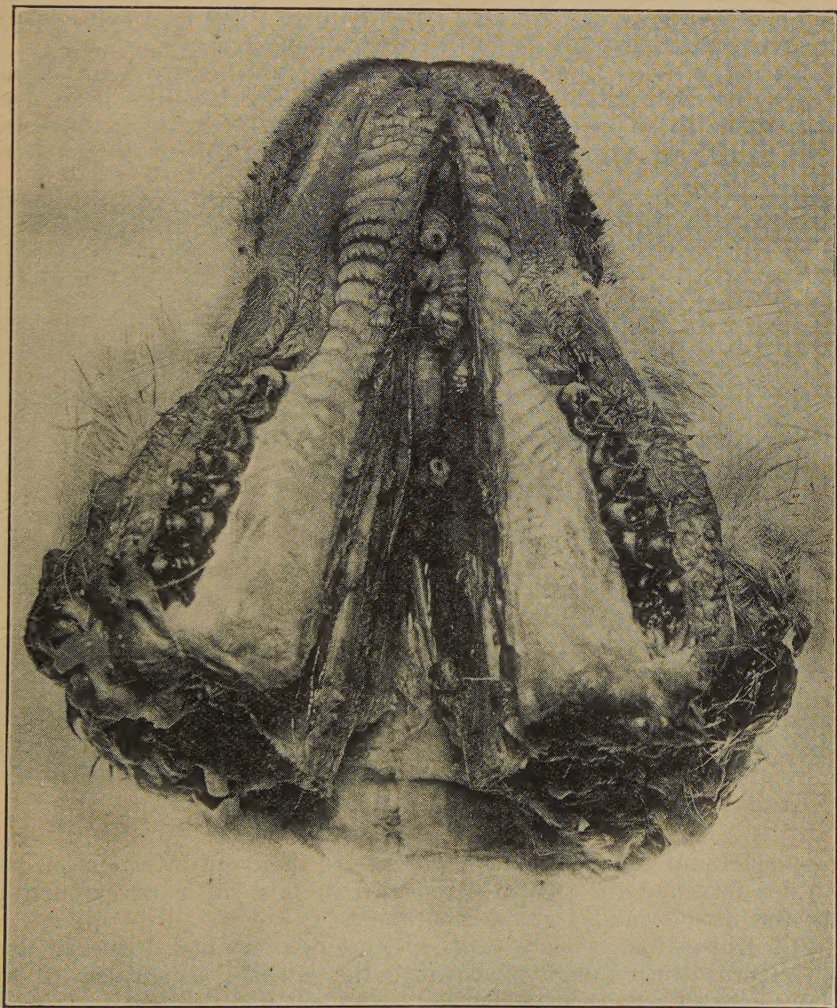


FIG. 97. Deer head cut through the median plane, demonstrating larvae of *Cephynomyia* sp. in the nasal passage.

case reports from certain localities, namely the northern counties, reveal that many deer are lost each year. The losses are generally reported to occur from December to April. Inadequate and poor food

* Contribution No. 6 from the Game Laboratory, George Williams Hooper Foundation for Medical Research, San Francisco, California.

supply accompanied by severe winters are often said to be partly responsible. The estimated mortalities are at variance in many cases.

Clarke¹ in 1912 made an investigation of deer parasites and found that all deer examined were parasitized. Some were more heavily infested than others. Some were infested with a number of species of parasites. The symptoms described were emaciation, diarrhea, general weakness and exhaustion followed by death. Young deer were found to be affected more often than older deer. The trouble was found largely in open country where the deer were feeding. Poor feed and adverse weather conditions were said to be predisposing factors.

During the past year reports similar to those received in former years were sent to this laboratory. From a few localities dead deer were submitted to the laboratory for examination. Our findings revealed that parasitism, poor food and unfavorable weather conditions were

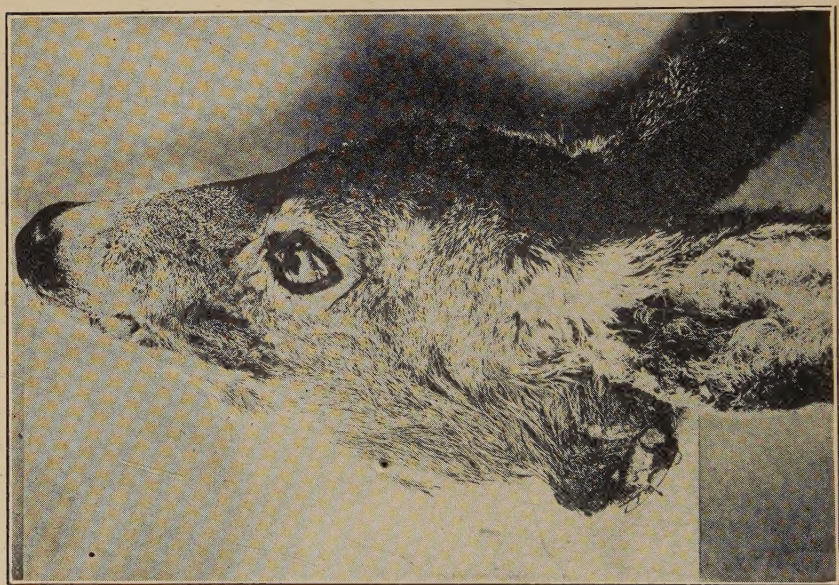


FIG. 98. A subsiding ulcerative keratitis in deer, with a corneal scab and opacity of the cornea.

responsible for the mortalities reported. No thorough investigation was carried out, and the parasites reported in this paper were found in the few deer examined at the laboratory.

Dipterous larvae, *Cephenomyia* sp. were present in all deer examined. The larvae were found attached to the mucous membranes of the sinuses, nasal passages, pharynx, pharyngeal pouches and larynx. In heavy infestation there was considerable irritation manifested by the hyperemic and congested mucous membranes.

One locality reported five deer to have an eye infection which terminated in blindness. Two heads were sent to the laboratory for examination. The specimens were infested with *Cephenomyia* sp. No extensive gross lesions were observed except a subsiding ophthalmia, which had

¹ Clarke, F. C. Parasites of the blacktail deer. Thesis. University of California Library. May, 1912.

or would terminate in complete opacity of the cornea. Ulcerative keratitis was seen in one case which appeared to be in a more acute inflammatory stage. Bacteriological examination of the cornea, aqueous and vitreous humors were negative. Three months later, a similar infection was reported in a herd of sheep in the same locality. One specimen was sent to the laboratory for examination with lesions confined to the sinuses, turbinate bones, olfactory portion of brain and the eyes. The maxillary sinus was partially filled with serous fluid and the mucous lining thickened and infiltrated. The frontal sinus and nasal passages contained *Oestrus larvae*. The ethmoid turbinates and olfactory stalks were congested and hemorrhagic. Both eyes had opacity of the cornea.

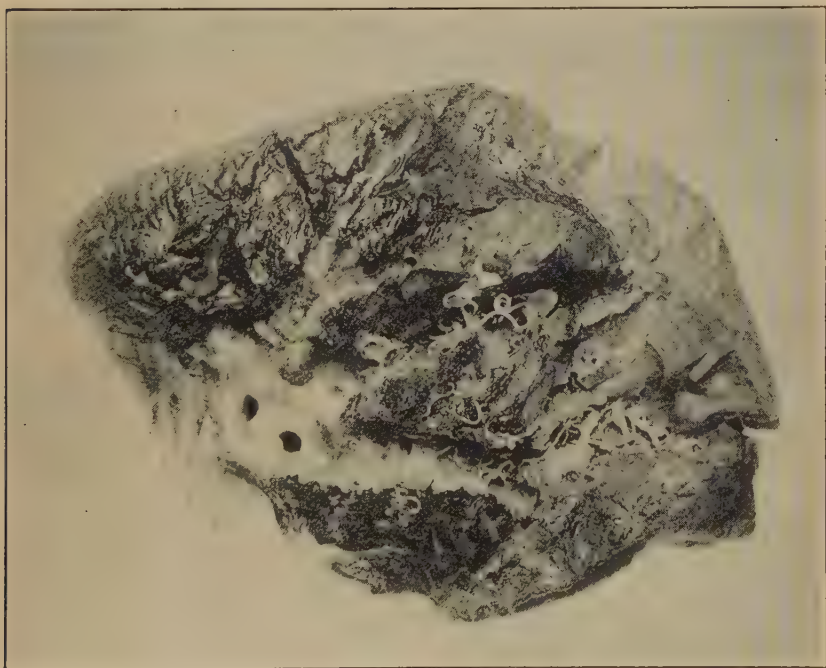


FIG. 99. Deer lung infested with lung worms, *Dictyocaulus immanis*. Bronchioles are filled with worms. (Natural size.)

The history of the specimens examined reveals that the trouble was not infectious in nature. Although no direct conclusive lesions suggest that blindness was the result of nasal larvae infestation, it appears that the infestation may be partly responsible for the total blindness in the animals thus affected. Further investigation will be necessary to confirm this observation. Walker¹ in 1929, reports that sixty deer died at Gunnison, Colorado, during late winter from being infested with *Cephenomyia* sp.

Lung worm infestation is also very common in deer. This parasite, *Dictyocaulus immanis*, was present in all cases examined. In heavy infestations it may produce a bronchitis and pneumonia. The bronchioles

¹ Walker, C. R. *Cephenomyia* sp. killing deer. Science, Vol. LXIX, No. 1799, June 21, 1929, p. 646.

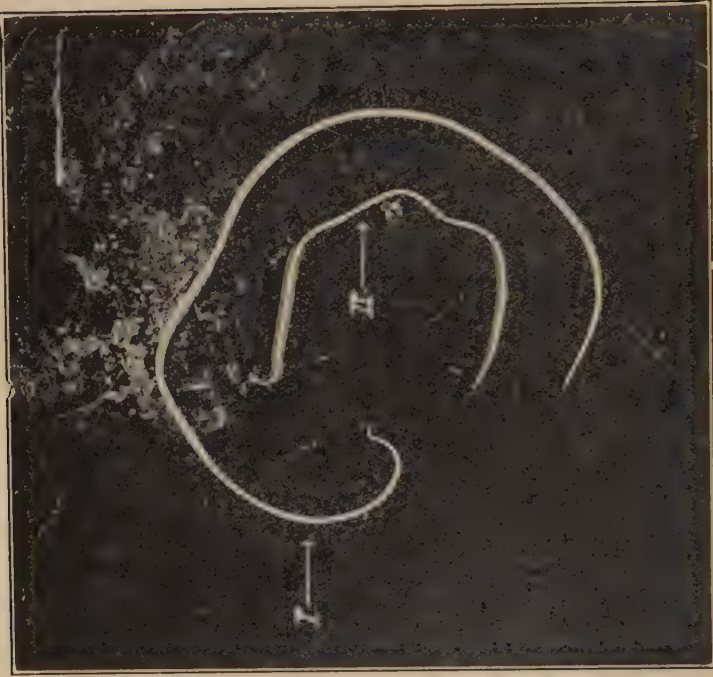


Fig. 101. *Setaria labiato-papillosa* of deer.
(1) Female. (2) Male. Natural size.

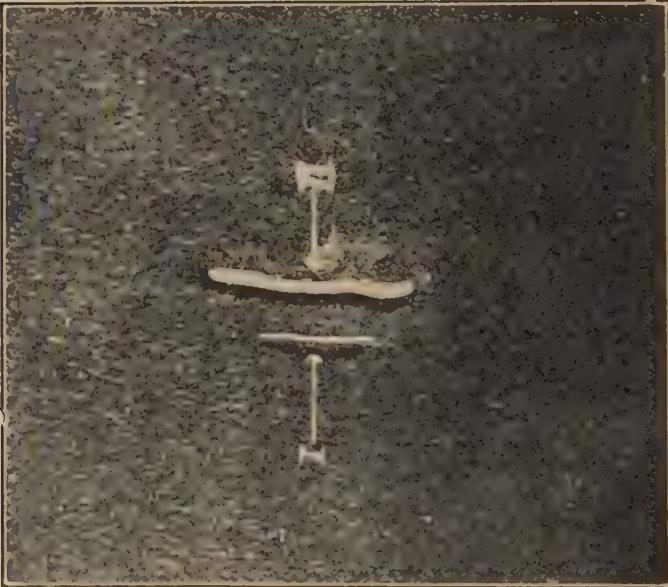


Fig. 100. *Oesophagostomum venulosum* of deer.
(1) Male. (2) Female. Enlarged 1.8 X.

are often occluded with worms, eggs and sanguinous muco-catarrhal exudate. The mechanical obstruction and inflammatory changes which are present may produce signs of atelectasis.

Oesophagostomiasis was also observed in specimens examined. *Oesophagostomum venulosum* may be found in the terminal portion of the small intestine, caecum and colon. This parasite has been reported to infest sheep and goats in Europe. The adult parasite was free in the intestinal tract.

The peritoneal round worm, *Setaria labiato-papillosa* was observed in two cases. It is found lying free in the peritoneal cavity on the intestines, stomach and liver. Little or no visible changes are produced

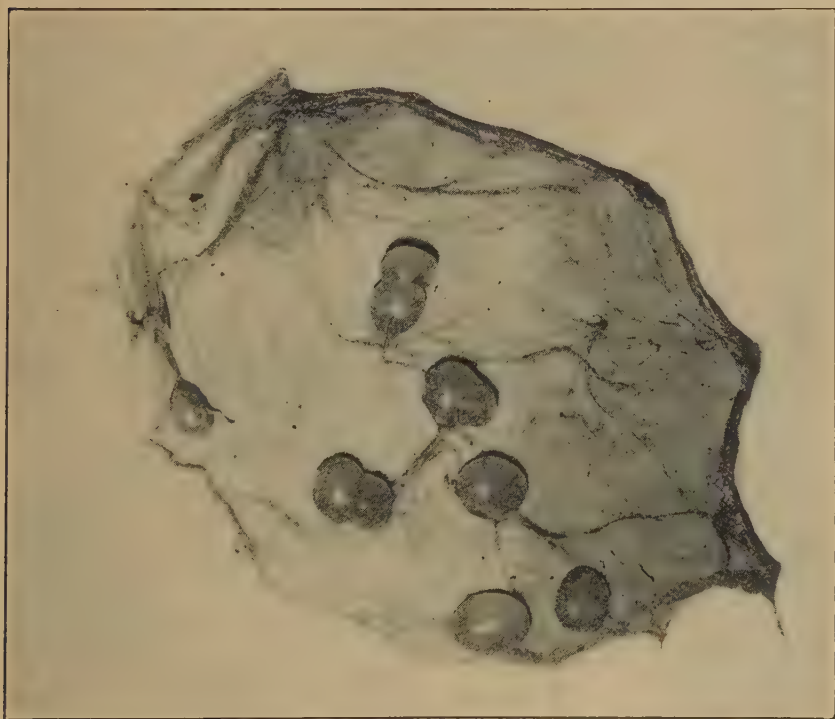


FIG. 102. Encysted cysticerci of bladder worm in the peritoneum of deer. Natural size.

in the abdominal cavity by this parasite. It is not considered very harmful.

Cysticercosis of the liver and peritoneum is often found in deer. The disease is better known to the layman as "bladder-worm" disease. It is a larval stage of a tape-worm, and may be found encysted in a connective tissue capsule filled with fluid. These cysts may be found in the peritoneum and on the liver. In 1911, a large number of deer in Franklin County were reported to have died from this disease.

There are other parasites such as lice, ticks and fleas which may be detrimental and injurious to the general health of deer.

Parasitic infestation in deer no doubt plays a role in the preservation of deer and is of significance from the standpoint of parasitic

eradication in domestic live stock. A thorough systematic investigation among deer losses in this state should be conducted to determine definitely how seriously parasitism affects the deer population and what relation deer parasites have to domestic live stock.

The parasites mentioned in this paper were identified by the zoological division of the United States Department of Agriculture, to whom we feel greatly indebted for their courtesies and services.

AN EXPERIMENT IN RESTOCKING A BASS LAKE WITH TROUT

By A. MUEHLEISEN

There is considerable controversy as to the practicality or economy of caging and raising fingerling trout for a period of time before liberation into the large lakes and streams of our state. It is the opinion of the writer that this system is both sensible and economical,

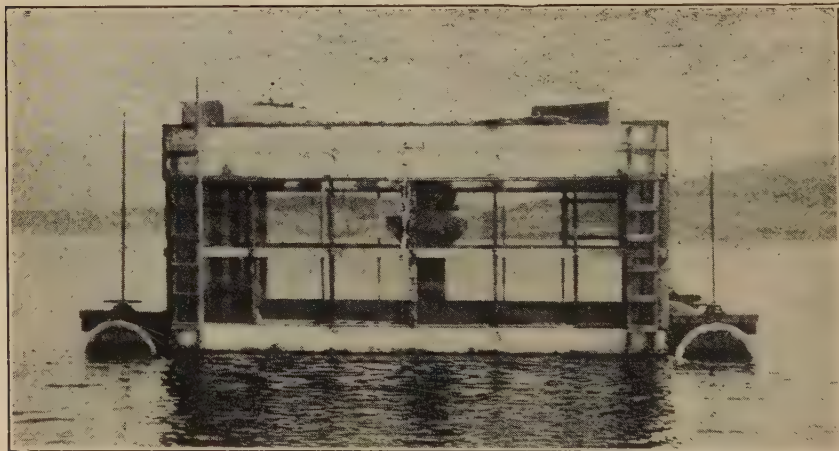


FIG. 103. A floating tank used as a nursery for trout in Otay Lake, San Diego County. Photograph by A. Muehleisen.

and the statement is based upon definite successful experiments conducted in San Diego County waters. The following facts may be of interest to both sportsmen and game officials of the state. Lower Otay Lake, one unit of the impounding system of the city of San Diego, covers an area of about 1300 acres, and has at the present time a capacity of approximately nineteen billion gallons of water. Lower Otay Dam was completed in September, 1919, but the first water impounded by February, 1919, true to custom in San Diego County, was immediately invaded with sunfish.

The sportsmen of San Diego County were, however, anxious to make a trout lake of Otay, so beginning in October of 1919, steelhead and rainbow trout were introduced annually up to and including 1925. By this time a total of 588,000 trout had been planted in the lake.

In October, 1921, Upper Otay, then a flourishing bass lake, overflowed its capacity, carrying down a generous supply of bass into Lower Otay. Following this occurrence, only an occasional trout was caught, and in the spring and summer of 1925 not a single trout was taken out

of Lower Otay, which by this time had become one of the best bass lakes in southern California. Certainly by now it looked as if Lower Otay as a trout lake was a decided failure. It is more than probable that the fingerling trout released through the period of years mentioned became food for the sunfish and bass during the first few days after liberation.

Keenly alive to the loss of these thousands of fry to San Diego sportsmen, the writer, serving as chairman of the Fish Committee of the San Diego County Fish and Game Protective Association, with the cooperation of the local state game wardens, Webb Toms and E. H. Glidden and other local sportsmen named to assist in the project, met with R. C. Wueste, superintendent of the city's impounding system, and other city officials to discuss the situation. As a result of this meeting, in the fall of 1925, a floating tank, twenty feet square and ten feet deep, was constructed. (See figure 103.) Besides this, a cement pond or small reservoir was also built, which was sixty feet long, thirty feet



FIG. 104. Holding pond for trout at Otay Lake, San Diego County, California.
Photograph by A. Muehleisen.

wide and five feet deep. A pergola was built across one end, vines and shrubs planted, and the pond was supplied with a continuous flow of water in the form of a spray. (See figure 104.)

On October 21, 1925, about 8000 small rainbow and steelhead fry were liberated in the two units. These were fed every day until July 15, 1926. At this time we had for liberation into the lake a conservative estimate of 2200 trout averaging about six inches in length. The loss seemed to average about the same in tank and pond.

This experiment was a new game to all of the committee. Several mistakes were made which again could easily be corrected, but as a whole, certainly this showing could be termed a successful experiment, and it was voted to continue on a larger scale. Another floating tank was therefore constructed, the same size as tank No. 1. On September 25, 1926, 32,000 trout (by actual count) were placed in the two tanks and cement pond, and these were fed daily.

During April, May and June, 1927, the committee liberated 9940 brown trout averaging eight or nine inches in length.

This year, 1929, several limits of brown trout weighing from two and one-half to five pounds have been caught in the lake, and the sportsmen are distinctly enthusiastic. If the same efforts had been put forth in a strictly trout lake, the results would have been augmented many times.

This story demonstrates that if trout are held in a receiving pond or tank a reasonable time before planting, it is possible to have both bass and trout in the same waters. It is an undeniable fact that both the trout and bass are cannibals, and prey on the small trout fry.

If the method outlined in this article is followed when receiving fingerlings to be planted in our lakes and streams, it is the belief of the writer that the supply of mature trout awaiting the sportsmen would be increased ten fold.



FIG. 105. A catch of large trout from Lower Otay Lake, San Diego County, California. Photograph by A. Muehleisen.

MONTEREY SQUID FISHERY

By RALPH F. CLASSIC

The squid fishery is the second largest fishery at Monterey, having taken its place next to the sardine industry since the time when salmon fishing at Monterey began to decline. The squid fishery, as described by W. L. Scofield, in the October, 1924, issue of CALIFORNIA FISH AND GAME, was started many years ago by the Chinese. In recent years, a Chinese merchant by the name of Wing Chong has increased the demand for dried squid in the Oriental markets, until the fishery has reached its present status. Several new firms have in recent years become interested in preparing squid not only for the foreign markets, but for local consumption. Consequently, several thousand cases of squid were canned in one-pound and one-half-pound tall cans by three companies in 1926 and 1927. The bulk of the canned squid is exported to Greece, where it is considered a delicacy. Two small canneries at Monterey, which are owned and operated by Japanese, are canning squid for their people in this country. A large eastern fresh fish company during the last three years froze several hundred tons of the

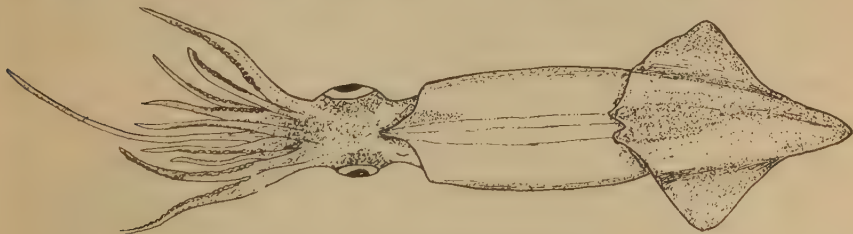


FIG. 106. Squid (*Loligo opalescens*).

fish, which were sold in this country. Fresh squid when well prepared is very tasty, especially when fried in pure olive oil.

The squid fishing at Monterey generally begins in April, a month after the sardine season terminates, and ends during the first part of July. During the past season, the squid fishing has declined as shown in the figures given below:

1926	1927	1928
2,101,052 lbs.	5,208,050 lbs.	935,590 lbs.

Squid are caught with lampara nets in the same manner as sardines. The fishermen make all of their catches at night and close in shore. From fifteen to twenty-five tons for one boat crew is considered a fair night's catch, although as high as forty tons have been caught at one time. Fishermen formerly received \$11 per ton for their squid. This price was increased to \$15 during the present season, due to the scarcity of fish. Five men make up a fishing crew and about fifteen boats operate during the squid season at Monterey.

All of the squid catch at Monterey is unloaded at the Fishermen's Wharf, where the fish are hoisted from the boats into hoppers and drained. Trucks then haul the squid to the fresh fish markets, the canneries or the drying fields.

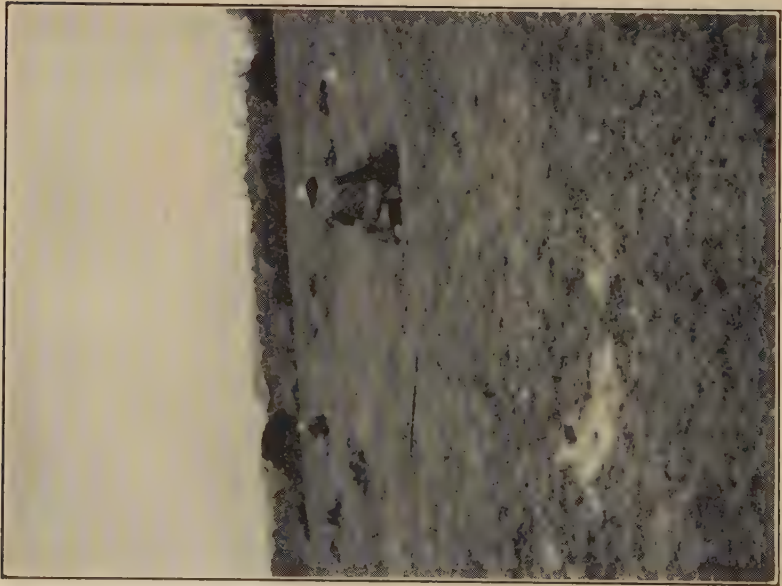


FIG. 107. Squid after drying in fields are raked into piles.
Area shown is about ten acres.

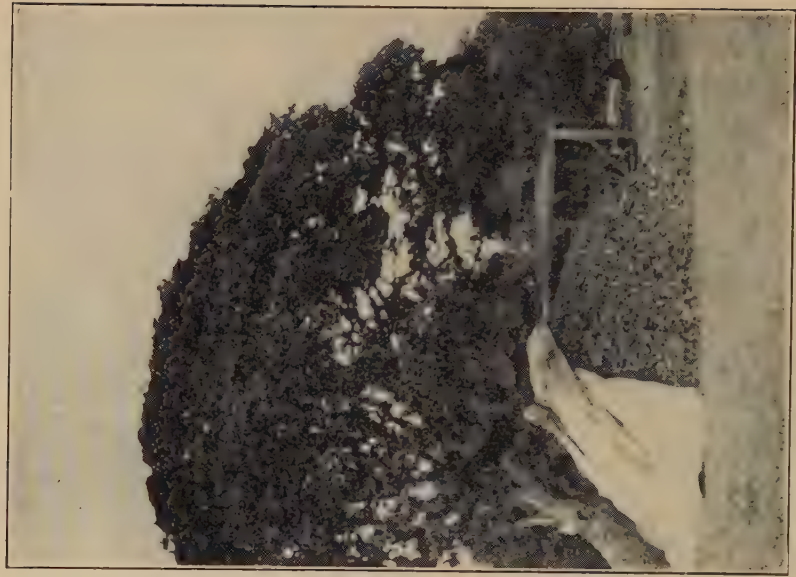


FIG. 108. Squid in large pile before cleaning and packing.

Eighty per cent of the squid received is sun dried for the Oriental markets. All of the drying is done in fields adjacent to Monterey, where ten or more acres of land are used. The process of sun drying is simple and rapid. Squid lose 75 per cent in weight during the drying process which, under ideal weather conditions, takes from five to six days. It is a simple process because the squid are spread and scattered on the ground and turned each day to expose all surfaces



FIG. 109. Squid cleaning machine showing squid going through shaker process.

of the flesh to the sun. After drying, the squid are raked into piles, as shown in figure 107, and carried in baskets to one large pile, as shown in figure 108. They remain in the large pile for nearly a week and undergo what is termed a "sweating" process. The squid, after drying, pass through a cleaning machine as shown in figure 3, before bundling and packing. This machine consists of a shaker, which cleans

the squid of dirt and grass gathered while on the fields. The squid, after cleaning, are pressed into bundles and wrapped in burlap. These packages weigh from 200 to 210 pounds each. The market value of this product is 8 cents per pound at San Francisco. Artificial drying of squid has so far been unsuccessful. The sun dried squid, although poorer in appearance, weigh more than squid dried by artificial heat and bring the same market price.

METHODS USED BY STATES TO COLLECT FISHERIES STATISTICS¹

By GENEVIEVE CORWIN

In order to get an accurate idea of the work done in fisheries statistics by other states, the writer sent a questionnaire to the Gulf, Atlantic, Great Lakes and Pacific states. As a result of this inquiry, it was found that ten of the twenty-one Atlantic and Gulf states collect no statistics whatsoever: Maine, New Hampshire, Rhode Island,² Delaware, North Carolina, South Carolina, Georgia, Alabama, Mississippi and Texas.

The following seventeen states use some sort of blank form for recording information: Massachusetts, Connecticut, New Jersey, Maryland, Virginia, Florida, California, Oregon, Washington, New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin and Minnesota.

The U. S. Bureau of Fisheries is largely responsible for the rather uniform and complete records taken by the states bordering the Great Lakes. The fishery there has decreased alarmingly, and in 1927 the bureau started a cooperative plan to increase the efficiency of collecting statistics which might prove helpful in improving the situation. New York, Pennsylvania, Indiana, Illinois and Michigan (that is, all but Minnesota, Wisconsin and Ohio) make provision for recording each day's catch and all are analyzing their statistics to determine the net results of the units of fishing effort. Minnesota collects statistics for each fishing season, and Wisconsin annually. Other states that keep annual records only are Connecticut, New Jersey, Virginia and Florida. Massachusetts and Louisiana are the only states collecting statistics each month, while Washington and Ohio collect at four-month intervals. Oregon and California keep daily records of catch.

California, then, is numbered among those states that collect fisheries statistics in a thorough manner, getting the information as fast as the fish are brought in, with all the necessary items in connection—amount, kind and price of the fish, with the name of the fisherman and dealer and locality where it is caught. The basis for the study of units of gear is now being worked out in tracing the ownership of boats and gear through the registration numbers. At present the work has gone only far enough to give an idea of what each boat brings in, but further studies are to be made to determine the results of each unit of gear. California is one of the few states that publish an annual report of the yield of the commercial fisheries.

¹ Contribution No. 82 from the California State Fisheries Laboratory, May, 1929.

² A bill for collecting lobster statistics is now pending.

COMPARISON OF ENGLISH AND UNITED STATES FISHING PORTS, 1926-1927 ¹

By GENEVIEVE CORWIN

People are rather generally interested in the relative importance of the fishing ports of California as compared to other ports of the world. The accompanying table is intended to convey the essential points and to give definite information on a subject that calls forth a deal of speculation from some quarters.

The six ports included in the comparison were chosen because of availability of statistics, and because the information was given in a comparable form. The figures for Grimsby and Hull, the two most important English ports, were obtained from the Monthly Return of Sea Fisheries, England and Wales, published by the Ministry of Agriculture and Fisheries. The Statistical Bulletins of the U. S. Bureau of Fisheries were consulted to determine the most important ports of the United States, outside of California, while the information for this state was obtained from the records of the California Division of Fish and Game.

Seattle (producing approximately 16,000,000 pounds a year) might be thought a possible rival, but is far below any of the six mentioned. Gloucester, Massachusetts, is far behind also. Some other European ports may be important enough for consideration, but for the present purpose they are not considered on account of lack of statistical information.

1926		
<i>Ports</i>	<i>Pounds</i>	<i>Value</i>
Grimsby, England.....	339,000,000	\$18,800,000
Hull, England.....	263,700,000	10,300,000
Portland, Maine.....	238,000,000	9,000,000
Boston, Massachusetts.....	167,300,000	7,000,000
Monterey, California.....	163,700,000	1,300,000
Los Angeles, California.....	157,700,000	3,000,000

1927		
<i>Ports</i>	<i>Pounds</i>	<i>Value</i>
Grimsby, England.....	356,100,000	² \$18,500,000
Hull, England.....	292,100,000	10,300,000
Portland, Maine.....	263,800,000	9,400,000
Los Angeles, California.....	200,400,000	3,800,000
Boston, Massachusetts.....	195,000,000	7,400,000
Monterey, California.....	186,000,000	1,400,000

Grimsby, Hull, and Portland, Maine, in the order named, are the largest fishing ports for both 1926 and 1927, from the point of view of both pounds and value. Boston maintains fourth place for both years in value, but Los Angeles in 1927 comes up from sixth to fourth in pounds. Monterey keeps sixth place both years in value but in number of pounds is lowered from fifth to sixth in 1927.

¹ Contribution No. 83 from the California State Fisheries Laboratory, May, 1929.

² The decrease may be due to lower price.

LEGISLATION PLUS EDUCATION EQUALS CONSERVATION

By WALTER R. WELCH

During the early days when I was actively afield with rod, gun and dog, I always considered October as being the sportsman's month, for in my opinion no other month of the year presents to the sportsman so many attractive features, nor offers so many advantages as does October.

"It is the brilliant autumn time, the most brilliant time of all,
When the gorgeous woods are gleaming and the leaves begin to fall,
When the pippin leaves the bough and the sumac fruit is red,
And the quail are calling loud from the pastures where they fed,
When the crops have all been housed, and the farmer's work is done,
And the woodlands are inviting the sportsman with his gun."

In brown October the ground is strewn with painted leaves, the migrant ducks, geese and shorebirds are working gradually southward, and the squirrels and chipmunks are busy storing nuts and acorns against the winter days to come.

The dense foliage of the forest shows traces of frost and the game cover has thinned sufficiently to afford the sportsman more than a mere glimpse of his scurrying quarry. Game birds and animals, as well as game fish native to the State of California, are in the finest possible condition. Quail, ducks, geese and other game birds are strong of wing and fit marks for the sportsman's aim. Deer, bear, rabbits and squirrels are fat and sleek, and trout and other game fish are in a fit condition to test the skill and tackle of the angler.

In short during the month of October all objects of the sportsman's quest are at their best. The weather is glorious, the days short, fresh and bracing, the nights long and frosty and the sky clear and blue as steel.

May success attend those who go afield with rod and gun during October, whether their chosen stamping ground be in the deep forest, along the bank of some rushing river or stream or lake on sodden marsh, or over chaparral covered hills!

May their sight be clear and true, and the rifle show no tremor, may the twin barrels leap to shoulder and the feathers fly from, and not with, the birds, and may their skill, and tackle when pitted against battling trout, bass, or salmon, meet with success!

In view of the strenuous efforts that are at this time being made to protect and conserve, if not increase, the pitiful remnant that remains of the once bountiful supply of fish, game and wild life that inhabited the state, I am wondering if a brief review of the history of fish and game protection in California would not be of interest to the present day sportsman.

Although the word "abundance" alone describes the supply of fish and game to be found in California by the early day pioneers, as early as 1850 it was realized that certain species of game were in need of protection. Therefore, the state legislature in 1852 enacted a law protecting elk, antelope, deer, quail, mallard and wood ducks for six months during each year.

In 1872 by an act of the state legislature, a State Board of Fish Commissioners was created, and in 1878 the jurisdiction of this commission was extended to include game.

Between 1872 and 1882 laws were enacted prohibiting the trapping of quail, establishing a closed season for trout above tide water and affording protection to salmon and some of the other species recognized as being game fish, birds and mammals.

In 1883 elk, antelope, mountain sheep, does and fawns were afforded perpetual protection, and in 1895 the transportation of game out of the state and the killing and sale of certain nongame birds for millinery purposes was prohibited.

The collection and sale of wild birds' eggs was prohibited in 1896, and in 1901 the sale of deer meat and hides, quail and certain shore birds was prohibited and a daily and season bag limit adopted as follows, viz: duck and doves, fifty per day; quail and Wilson snipe, twenty-five per day, and three male deer per season. Night shooting was also prohibited.

In 1905 a daily creel limit of fifty was placed on trout; swan and all shore birds (Limicolar) were protected, the sale of doves and all shore birds prohibited and the bag limit of doves reduced to twenty-five.

A hunting license system was adopted in 1907, and the daily bag limit of ducks reduced from fifty to thirty-five. State game refuges were established in 1909, the sale of trout and black bass prohibited and the daily bag limit of ducks and black sea brant reduced to twenty-five in 1909.

In 1911 the state was divided into six fish and game districts, dealers in wild game were required to secure a license and keep a record of all game received by them and in addition to the daily, a weekly bag limit of game birds was adopted. An angling license system was adopted in 1913.

The killing of spike bucks was prohibited in 1915, a daily and weekly bag limit of honker geese and black sea brant adopted, the daily bag limit of dove, quail and snipe reduced to fifteen, and wild pigeons afforded protection.

In 1917 the sale of wild ducks and geese was prohibited and in 1927 a duplicate deer tag system was adopted, the hunting and angling license fee increased from \$1 to \$2 per year, and the Division of Fish and Game, Department of Natural Resources, created.

In 1895 and 1896, from an examination of the books of the game dealers in the cities of San Francisco and Los Angeles, made by the Fish Commission, it was ascertained that during these two years there were sold in the open markets of these two cities, 177,366 quail; 254,227 wild ducks, and 62,958 wild geese and shorebirds.

These figures do not include quail, ducks, geese and shorebirds sold in other cities and towns within the state, nor the birds killed and consumed by hunters, their families and friends.

The 177,366 quail sold for \$15,160.08, or at an average price of less than 10 cents apiece, and the 337,185 ducks, geese and shorebirds sold for \$62,363.01, or an average price of less than 12 cents apiece.

When it is considered and realized how valuable wild life is at this time, and how it is now being commercialized in the interest of all of the people, and not in the interest of any privileged few, these figures

should certainly furnish sportsmen of the present generation with food for thought.

In 1900, realizing that the supply of fish and game was rapidly decreasing, and recognizing that some effort should be made towards the enactment by the legislature of laws providing for the better protection of fish and game, at the suggestion of Governor Henry T. Gage, a statewide convention of sportsmen was held.

This convention of the sportsmen of the state was called by the then state fish commission and was held at the rooms of the California Jockey Club, on Kearny street, San Francisco, on the twenty-fourth day of May, 1900.

The delegates who attended this convention were composed of two men from each county within the state, selected by the board of supervisors within their respective counties, and a great number of delegates at large selected by the fish commissioners.

The purpose of this convention was to discuss, consider, draft, and recommend for passage at the session of the legislature to be held in 1901, such laws as were considered to be necessary for the proper protection of fish and game, such as bag and creel limits, nonsale and laws for the protection of fish and game during the recognized breeding and spawning seasons.

A large number of delegates representing many sections of the state attended this convention. Judge Hughes, of Sacramento, was selected to act as chairman of the convention, and Andy Ferguson, of Fresno, was selected to act as secretary.

The first matter to be given consideration by the delegates was an open season and a bag limit for ducks. The first recommendation along these lines was that the open season be from October 1 to February 15, with a daily bag limit of 150 ducks. The convention held a three-day session, and after much discussion and various recommendations in regard to the daily bag limit of ducks, it was finally agreed, but not finally settled, that the daily bag limit of ducks should not exceed fifty, but a motion to recommend the passage of a law to that effect failed of adoption.

A motion to prohibit the sale of wild ducks failed to receive a second, and a motion that the sale of quail be prohibited was supported by only five of the delegates who attended the convention and was lost by a large majority.

At the close of the convention, which had been in session for three days, a few sportsmen assembled around a table in the convention hall and hurriedly formed an association known as "The California State Fish and Game Protective Association" and elected Harry T. Payne, president, and G. H. T. Jackson, secretary.

During the next succeeding five years, this association became a statewide organization with not less than 100 affiliated county associations and having a membership consisting of many thousands of sportsmen located in all parts of the state.

At that time, viz, in 1900, the state appropriated the sum of \$3,750 per annum to be used for game protection. In 1903, this sum was raised to \$7,500 per annum, which was all the money available for game protection in California until the adoption of the Hunting License Act in 1907.

I believe it can be readily realized how little could be accomplished with the sum of only \$3,750 available for use in the protection of game in a state as large as California, a sum far less than is now expended every year by many duck and other clubs within the state.

Upon the convening of the state legislature in 1901, a conference was held by Governor Gage, H. W. Keller, president of the State Fish Commission, and H. T. Payne, president of the California State Fish and Game Protective Association. At this conference it was agreed that the following bills be introduced and their passage by the legislature recommended, viz: That the open season for quail, partridge, grouse, sage hens, wild ducks, rail, curlew, ibis and plover be from October 1 to February 15; that the open season for male deer be from August 1 to October 1; that the open season for tree squirrels be from August 1 to February 1, and that the open season for trout above tide water be from April 1 to November 1; that the daily bag limit of quail, partridge, snipe, curlew and ibis be twenty-five; that the daily bag limit of wild ducks and doves be fifty; that the daily bag limit of rail be twenty, and that the bag limit of male deer be three per season, and that no hunting would be permitted a half hour after sunset and a half hour before sunrise.

It was also determined: That the sale of quail, partridge, sage hens, grouse, ibis, plover, deer meat and deer hides be prohibited, and that the sale of trout of less than one-half pound in weight be prohibited; that the open season for black bass be from July 1 to January 1, and that black bass be taken on hook and line only; that the closed season for striped bass be from May 31 to July 1, and the sale of striped bass of less than one pound in weight be prohibited, and that no striped bass be taken in nets of less than seven and one-half inch mesh.

These bills being what might be termed "administrative measures," having the support of the governor, were passed by the legislature and became effective early in 1901.

The passage of these laws is considered the first real constructive move to have been made by the sportsmen of California for the protection and conservation of fish and game in this state.

It will thus be seen that prior to 1901, with the exception of laws that provided for short closed seasons, there were no laws for the protection and conservation of fish and game in California.

Prior to 1892, with the exception of elk and antelope, there was no very noticeable decrease in the supply of fish and game and very little real effort was made by the sportsmen of the state for its protection.

Following the enactment of these laws, their enforcement was defied by market hunters, commercial fishermen and others and soon after the opening of the duck and quail shooting season in 1901, it was found that hunters were endeavoring to evade the bag limit and nonsale law by shipping ducks, quail and other game in concealed packages such as butter boxes and kegs, suit cases, trunks, rolls of blankets, green cow hides, coal oil cans, boxed demijohns, egg cases, etc.

In the efforts made by the fish and game dealers of San Francisco to restrain the fish commissioners and their deputies from performing their duty in enforcing the fish and game laws, damage suits and suits for injunction were undertaken against the commissioners, with the

result that it was necessary to take many cases into the superior and supreme courts in order to establish the constitutionality of the laws.

Prominent among these cases are those entitled *Duprat vs. Board of Fish Commissioners et al.*; *Ex parte S. Kenneke*, *Ex parte Knapp*, and *Ex parte Maier*, with the result that the constitutionality of the fish and game laws were upheld, that the courts declared that the "wild game of a state belongs to the people, in their collective sovereign capacity and is not subject to private ownership except in so far as the people may elect to make it so, and that they may, if they see fit, absolutely prohibit the killing of it, or traffic or commerce in it. That its taking, possession, and the disposition thereof is subject to legislative enactment," and that the fish commissioners and their deputies could not be restrained in the performance of their duty in the enforcement of the laws.

With the \$7,500 per annum appropriated by the state for game protection, coupled with the money received from fines imposed upon fish and game law violators and the sale of commercial fishing licenses, the fish commissioners to whom were entrusted the enforcement of the laws were not able to maintain in the field for the enforcement of the fish and game laws to exceed ten regular salaried deputies and a few volunteer deputies.

The organization of the California State Fish and Game Protective Association in 1900 was the beginning of the state-wide organization of sportsmen in California. This association was composed of individual membership, and the affiliation of county associations and clubs located in various sections of the state. The association was active until about 1912, and to it is due the credit for the enactment of laws prohibiting the sale of deer meat, deer hides, quail and other game, trout and black bass, the adoption of bag and creel limits, hunting and angling licenses and other important fish and game laws. In 1912, the association disorganized and was reorganized as the "California State Fish, Game and Forest Protective League." For several years following its organization, the league was active, but about 1916 it began to decline and about 1924, went out of existence.

In 1912, an organization known as "The Great State Fish and Game Protective Association" was organized. This organization went out of existence within two years and was succeeded about 1923 by an organization known as "The California Conservation League." This organization was also short-lived.

In February, 1925, an organization known as "The Associated Sportsmen of California" was founded. This organization is still active, and at the present time is composed of individual membership, and the affiliation of about 125 county and local fish and game protective associations and clubs representing many thousands of sportsmen located in all sections of the state. During its existence, this organization has accomplished much for the protection and conservation of the fish, game and wild life of the state, and at the present time bids fair to continue actively in the work for many years to come.

While it is conceded that fish and game protective associations and clubs, both state-wide and local, working in harmony and cooperation with the state fish and game commissioners, *can and do* accomplish much good for the protection and conservation of fish, game and wild

life of the state it appears that without harmonious cooperation and the direction and supervision of interested and active sportsmen as their officials the average life of such organizations seldom exceeds three years.

For some years past it has been generally admitted that the days of fish and game abundance in this country have gone by—*never to return*. I am impressed by that fact. Consequently it is necessary for sportsmen all over this state to become interested in the work now being done for the protection of fish and game, and that they take an active part in the efforts being made to restock the depleted game fields and public waters.

If it is worth while to protect and conserve wild life of the state, and it certainly is, then it is the duty of every sportsman who loves the great out-of-doors to take up his share of the burden and assist those now on the "firing line with the army of defense."

The essentials necessary to accomplish the problem successfully are the enactment of sane, simple and scientific fish and game laws. In substance, these laws should be few as possible, brief in language, simple in terms, supported by scientific facts regarding the habits and breeding seasons of the various species of fish and game, and devoted to fundamental regulations respecting open and closed seasons, bag and creel limits, possession, nonsale, etc.

The education of the people as to the value of a supply of fish and game and the necessity for fish and game laws is undeniable. Those who are capable of being educated as to the importance of protecting fish and game should be trained along these lines and the others should be impressed by the stronger process of strict law enforcement, and the imposition of severe penalties for violating the laws.

The enforcement of the fish and game laws is both onerous and disagreeable, particularly in communities where public sentiment is adverse to such laws, nevertheless it is a duty that someone must undertake unless we are ready to concede that our whole theory and system of wild life protection is a failure.

Perverted public sentiment in regard to the fish and game laws can be changed by education and lined up on the side of the laws and their strict enforcement. However, education must be the handmaid of law enforcement and not assumed to precede the latter, for in that event it may arrive too late and only when the supply of wild life has been exterminated.

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DECEMBER 15, 1929

"Research in game problems is a comparatively new idea. Scientific investigation often involves much time and expense. Results are not always tangible or apparent to the layman. It is never spectacular or thrilling. It involves patience and skill. But it discloses facts."

WESTERN COMMISSIONERS MEET IN SAN FRANCISCO

The ninth annual meeting of the Western Association of State Fish and Game Commissioners was held at the Palace Hotel, San Francisco, August 23 and 24. President I. Zellerbach presided at the opening. The address of welcome was given by Fred G. Stevenot, director, Department of Natural Resources, State of California. A number of splendid papers were read. David H. Madsen of Utah discussed game management and the new Bear River Migratory Bird Refuge. E. L. Perry, State Game and Fish Warden of New Mexico, emphasized the importance of furnishing proper environment if a supply of game is to be maintained. There were two papers on the economic value of birds and several papers dealing with fish propagation and stream pollution. Paul A. Shaw of the California Division of Fish and Game presented a summary of the work accomplished in duck disease investigations. Forest Service cooperation was discussed by W. J. Nelson, Acting District Forester, and Biological Survey cooperation by George Tonkin, United States game protector.

On the last afternoon a resolution favoring the fifteen duck limit was passed. This led to considerable discussion pro and con.

E. L. Perry of New Mexico was elected president, Bruce Nowlin of Wyoming vice president, and Clinton W. Rowley secretary and treasurer.

Among the resolutions passed were the following:

WHEREAS, The ninth annual convention of the Western Association of Fish and Game Commissioners, assembled in session at the Palace Hotel, San Francisco, have been entertained and discussion has brought out several important principals concerning conservation in western states; therefore be it

Resolved, That the most fundamental need looking toward better game management is more knowledge of life history and habits of game species and that every encouragement should be given to scientific research by various game departments leading to accurate statistics and useful data which will aid in the solution of the many important problems which confront the western states; and be it

Resolved, That duck sickness is a serious menace to wild fowl in western states and that additional investigations prosecuted and special endeavor should be made by the states concerned to prevent further outbreaks; and be it

Resolved, That in view of the need for additional feeding and breeding grounds for wild fowl that a committee be appointed to investigate and report on the feasibility of reflooding Lower Klamath Lake.

The sessions closed with a splendid banquet held in the French Parlor of the Palace Hotel. The entertainment was furnished by well-known radio artists.

CIVIL SERVICE EXAMINATION GIVEN WARDENS

Ever since 1913 the deputies of the Division of Fish and Game have been under civil service. Periodically examinations are given, and this past summer more than 300 men took the written examination. Of this number, 129 passed it. About 70 men who passed both the written and the oral test are now on the certified list.

A particularly fine group of men presented themselves for the examination. The oral tests were held in a number of different parts of the state. Usually a National Forest Service official, a Civil Service official and a Division of Fish and Game official comprised the examining board. By depending upon this method of selection, the general tone of the patrol service has been raised and political appointments avoided.

RESEARCH PROGRAM DELAYED

Again it has been shown that the state does not pay sufficient salary to hold scientific investigators. During the summer two of the ablest men conducting research for the Division of Fish and Game have been tempted to eastern positions by higher salaries. Dr. Henry Van Roekel, who for nearly two years has acted as pathologist in connection with

investigations of disease of game birds and animals, has resigned to accept a splendid position as head of the veterinary laboratory of the Massachusetts Agricultural College at Amherst, Mass. Dr. E. C. O'Roke, who discovered and explained a strange malady which attacks quail, resigned on September 1 to accept a position as assistant professor of zoology in the College of Forestry and Conservation of the University of Michigan, where he will continue investigations similar to those he prosecuted here.

In times past the better qualified men at the State Fisheries Laboratory have been tempted to eastern positions by offers of higher salaries; this time an important research program relative to disease of game birds and animals will have to be delayed until men can be found to fill the places of these investigators.

DUCK SICKNESS

During the past winter a number of experiments have been carried on to determine the toxicity of samples of alkali secured where duck sickness has appeared in years past. These experiments at Hooper Foundation for Medical Research have indicated that relatively small concentrations may cause death.

The major work this past winter has consisted of a series of chemical analyses of soil samples collected in places free from disease and in those places where disease is prevalent. Samples have been secured at regular intervals and the result should show variation in concentration from month to month as well as indicate the main differences between the concentrations at danger points and those places where disease is not prevalent.

With the outbreak of the disease at the Bear River marshes at Great Salt Lake in August, Paul A. Shaw was sent to the area to continue investigations in the field.

An earnest endeavor is being made to solve this important problem related to the conservation of waterfowl.

SUMMER RESORT EDUCATIONAL PROGRAM

As in past summers, the Bureau of Education and Research has made an endeavor to reach summer vacationists with an educational program. The chief of the bureau spent two months in Yosemite helping with the nature guide program and in directing and training a group of students attending the Yosemite School of Field Natural History.

As formerly, the number of students in the school was limited to twenty, and this

year ten men and ten women received training. These students will go back to teaching and other vocations and in many different sections will pass on conservation ideas to others. This seems to be a fundamental means of reaching numerous people throughout the state.

Yosemite National Park rangers were given special training this past summer and aided in the educational work. Camp fires were held in two of the public auto camps, and here a ranger-naturalist talked each night. In addition, outpost educational work was established at Mariposa Grove of Big Trees, Glacier Point and Tuolumne Meadows. As a result of these developments a larger number of visitors was reached than ever before.

Two representatives of the division conducted a splendid educational program in California State Redwood Park. An innovation this year was the addition of illustrative materials in the form of lantern slides and motion pictures, used in connection with lectures at the camp fire.

During the month of July more than 14,000 persons came in contact with the service by accompanying a party afield, or listening to an evening lecture. The grand total for the month of August amounted to 12,617.

By making contacts with summer vacationists the citizens of the state are led in an easy and natural way to understand and take an interest in natural resources.

PHEASANTS LIBERATED ON SANTA CATALINA ISLANDS

William Wrigley has been financing a sizeable game farm on Santa Catalina Island. Though largely a show place, a number of pheasants reared on the farm have been liberated recently near Avalon in an attempt to stock the island with this game bird. Special publicity has been given this liberation in order that citizens may give the birds proper protection until they have become established.

ENVIRONMENTAL CONTROLS

Every game crop is the resultant of two forces: (1) the breeding habits of the species, and (2) the environment in which it lives.

Breeding habits are constant. Environment is the variable.

If the environment is favorable there will be a crop; if unfavorable there is no crop, and even the capital stock may decline.

Environment is the summation of many factors—food, cover, predators, hunting, disease, etc.

Bird lovers, by and large, have made the mistake of seeing only one of them—hunting.

Sportsmen, by and large, have made the mistake of seeing none of them. They insist on turning out stock without regard to whether the environment is fit to receive it. If the environment were improved the constant planting of stock would be unnecessary. It is often cheaper to improve environment than to constantly plant game.

Foresters are taught from the outset the futility of planting in unfavorable environments. They are schooled from the outset to the broad idea of environmental controls. Foresters can render a great service to game conservation by helping to work out a technique of environmental controls for game.

No state stands in greater need of such work than Iowa. The prairie chicken has been crowded out of the state, probably by reason of the elimination of residual patches of prairie cover. The quail is being slowly but surely reduced by the grazing out of woodlots, the devegetation of creek banks and drainage channels, and the elimination of fence-rows. Waterfowl are shrinking before the advance of drainage. The only basic remedy is environmental control.

Most thinking conservationists realize this. What they do not realize is that favorable game environments in the past have been accidental, whereas from now on they must be built by human hands and brains, for the deliberate purpose of raising a game crop.

Here enters the mission of game research. It takes more knowledge to put together than to take apart. Just how do we build a quail range? How much cover, and what kind, must be put into this gully to make it produce a covey every year? How can that cover be arranged to give minimum interference to the adjacent crop and maximum erosion control to the adjacent ploughland? What cover plants produce food as well as cover for the quail? What kinds and numbers of predatory species can be allowed to inhabit it? What supplementary winter feeding is necessary? When? What mechanical arrangement will prevent winter feed from being covered by snow or sleet, or eaten by less valuable species, when worst needed by the quail?

The exact answers to such questions must be worked out for each species and each region, just as analogous questions are being worked out for each species and region in forestry. Some think a guess is good enough, but foresters know from experience in their own field that technique based on guesses is expensive in

the long run. There is a best way. Foresters can help find it.

Agriculturists as well as foresters can help find it. The technique of environmental controls for game production must be dovetailed to both farming and forestry at every point, else it will never be practiced. Game is essentially a by-product of farming and forestry. If the system of raising the by-product interferes with the main crop, the by-product will not be produced. If it does not interfere, but actually benefits the main crop, economic as well as altruistic forces will eventually bring about its adoption. Most game crops can be made to benefit the main crop. "Environmental Controls—The Forester's Contribution to Game Conservation," by Aldo Leopold. *Du Pont Promotion News Bulletin*, No. 35, May 24, 1929.

A NATION BEGINS BUT ONCE

"In a hundred and fifty years a virile, resistless, acquisitive people have swept our country from the Atlantic to the Pacific coast. From Jamestown and Plymouth they have pushed the frontier before them until it has disappeared. The wild turkey vanished before the domestic hen. Sheep replaced deer. The buffalo gave way to better beef breeds; grains and fruits have been substituted for nuts and wild berries. The Conestoga wagon, the canal, the steam railway, the automobile, and the airplane have followed each other in rapid procession—all within the memory of father and son. Towns and cities have been built, many of them among the world's largest, and more than half our people live in them. We win wars for other nations and lend them money with which to mend their wrecked fortunes.

"We are admittedly the richest, most powerful nation in the world and we took this power of wealth out of the ground. Now, we must invoice our resources and determine how we should proceed from here. For a nation begins but once." Hubert Work, Secretary of the Interior, "Foreword" in "Our Federal Lands" by Robert Sterling Yard, 1928.

ELECTRIC BROODERS USED AT GAME FARM

Efforts to improve production at the Yountville Game Farm have resulted in the use of an electric brooding system. Many difficulties were encountered last season with domestic hens, chief of which was the transmission of disease to young birds. Hence, it was decided, if possible, to eliminate the objectionable hen and to rear Chinese ring-necked pheasants entirely by artificial processes.

A small electric brooding house was constructed during April, consisting of nine compartments each completely equipped with heating apparatus. Bantam chicks were first tried in order to test out the general plan of the new unit. The first incubated batch of pheasants to be placed in them made a splendid growth and only three of 407 died. The mortality of the second group of brooded pheasants was unusually low.

It is now believed that the electric brooding unit has solved a very real and perplexing problem. Continued broodings have permitted healthy, well developed birds to be transferred to the rearing pens. Losses have remained small. For instance, a report for the week of May 24, on four brooders, shows a loss of but fourteen birds out of a lot of 160; of twelve out of a lot of 156; of eleven out of 150 and thirty-five out of 105. The greater loss for the last brooder enumerated is explained by the fact that pheasants ordinarily classed as seconds were placed in it. Under normal conditions, such misfits would not be used. In this case, the electric brooder permitted a very good percentage of the birds to be salvaged.

It has been maintained that pheasants electrically hatched and brooded lose somewhat their wild instincts and are much tamer than hen-brooded birds. Observations thus far made do not substantiate this, for these pheasants that have never known a domestic mother are extremely wild and difficult to handle.

Another innovation, a different method of feeding, has been productive of excellent results. Pheasants fed on dry mash and given no water, save tomato juice, have grown rapidly.

STATISTICAL REPORT ON FRESH AND CANNED FISHERY PRODUCTS

No other state or country so far as is known keeps so complete a record of fishery products as does the State of California. Every packer of fish has to report monthly to the Division of Fish and Game the amount of fish received and the amount of fish packed. This report must be rendered by all persons packing any species of fish, mollusk or crustacean by any method. As a result of this requirement, it is possible to compile a statistical report of all of the fresh and canned fishery products.

Circular No. 3, published in June, 1929, gives the statistics for the year 1928. This circular is available on application to the Division of Fish and Game, San Francisco:

Among the more interesting figures are the following:

Total cases of canned products, 4,431,498; the total catch of fish, 517,746,166 pounds; abalones, 2,066,243 pounds; sardines, 420,269,665 pounds (more than three-fourths of the total catch); salmon, 4,478,566 pounds; tuna, 13,783,536 pounds; albacore, 283,321 pounds. Thirty sardine canneries were in operation during the year.

NECESSARY FACTS

At conventions it is common to hear advocated the need for more dependable information on the life history and habits of game species. Any who may have scoffed at the scientist, now usually admit that solution of difficult problems comes more often from the laboratory than from the discussion room. Though the need for scientific research may have been apparent to only a few in the past, it is being appreciated now by the many.

Try to gather evidence on any controversial subject—How many fish will a mile of typical stream support? How many quail are killed by hawks? What is the cause of duck disease?—and one is astounded at the paucity of reliable data. Data useful to engineering problems is much more accessible than that on biological subjects. Admittedly, biological questions are more intangible, but that is not the only reason for lack of data. In part, at least, the reason is to be found in the lack of support for research problems in connection with game. It has been more simple to get appropriations for killing campaigns than for research as to the economic value of the species concerned. It has been easier to establish a bounty fund than to secure money to find out if a species is useful or detrimental.

It now appears that interest in getting the necessary facts by research is growing. Organizations other than universities are now supporting research on game. In addition to governmental research, various states are instituting research programs. New York has a stream survey in progress. California is investigating duck disease, studying the fisheries, Washington is gathering statistics on fur-bearing animals. A new era is near at hand when new projects will be undertaken only after proper knowledge secured by experts is at hand. This kind of advance assures better care of natural resources and increases ability to predict results.

THE NEW LOS SERRANOS GAME FARM

California's second game farm, where various upland and other game birds will be propagated for distribution in the game territory of southern California, will soon be functioning. The pens and rearing field have been completed and the construction of help's quarters and feed and incubator houses is nearing completion. The buildings are of Spanish style architecture and harmonize with the buildings nearest the farm.

The new farm is located on a twenty-nine acre tract close to the Los Serranos Country Club, a few miles from Chino, in what is considered ideal surroundings for the raising of game birds.

The enclosure for the birds is 270 feet wide, 312 feet long and contains 122 pens. These pens are 24 feet square and 7 feet high. All fencing materials such as posts, rails and gates are of steel, and heavy galvanized wire is used to cover the sides and tops of the pens. The only wood used is three eight-inch boards that are placed at the bottom of all pens, and the frames used for the removable partitions.

At the first farm at Yountville, wood construction was employed, but in the new farm a more permanent type has been used, the first of its kind on the Pacific coast. Though patterned after the Yountville farm, the new one will have a large rearing field. In September the farm was ready to house the heavy shipment of 1500 pheasants that August Bade, superintendent of game farms for the Division of Fish and Game, sent to stock the new farm.

The estimated cost for the living quarters for single and married help, feed and incubator houses, grading, the erection of the wire enclosure, and the installation of the unique sprinkling and watering system such as is used at the Yountville farm, is \$20,000.

CALIFORNIA'S DUCK KILL

There have been many estimates as to the actual number of ducks killed by hunters each open season. Not many of these are based on actual statistics. It is, therefore, worth while to call attention to the series of figures gathered by Colonel Edward L. Munson and published in an article on "Why Lower the Duck Bag Limit?" which appeared in *Outdoor Life* for August, 1929.

"* * * Let me give you some facts of my personal knowledge! I shot on the second day of the 1928 season at a commercial club, the manager of which said that more than 900 ducks had been

brought in on the previous day, included in which were nineteen limits of twenty-five birds each. I was informed of a private club in which twenty members brought in twenty limits on the same day—and after these 500 birds were brought in the keepers went around with retrievers and picked up 100 more. One of my friends, who is a persistent hunter but does not consider himself an expert shot, told me that he bagged 403 ducks in the season of 1928, and 432 in 1927.

"I have in my possession the official statement of a certain duck club in the San Joaquin Valley. There are eighty-seven members of this club, of whom about sixty shot at various times during the 1928 season. The birds bagged were reported by days, varieties and numbers. There were thirty-one open days and an average of thirty-eight shooters on each open day. The total number of birds bagged at this club during the season was 16,545; which, with the modest estimate of one duck lost to each five bagged, would reach a grand total of 19,845. The average number of birds bagged by the average shooter, for the entire season, was 435. On October 1 there were seventy-two shooters, who bagged 1006 ducks; on December 30, seventy shooters bagged 1456 ducks; on January 6, seventy-two shooters bagged 1488 ducks. On this club there are 280 sunken barrels, so that wherever the duck flight may shift, the gunners have concealment under it.

"* * * On opening day, 1928, two commercial clubs in the San Joaquin Valley (names furnished on application) had 302 limits of twenty-five birds each brought in, or the vast total of 7550 birds. This did *not* include the bags of hunters who brought in less than twenty-five birds each, nor did it include a probable additional 20 per cent of crippled or lost birds. If a limit of fifteen instead of twenty-five birds had been in effect, there would have been a saving of 3200 ducks for this one day, from these two clubs alone. Take another club—a commercial one—on Salton Sea, in southern California. Its records for the season of 1928 showed that 83 per cent of all its patrons killed limits of twenty-five birds each."

WHAT IS CONSERVATION?

"Not so long ago the general public was laboring under the delusion that a conservationist was a fellow equipped with a long face, sideburns, an unlimited supply of 'don'ts' and an ambition to prevent sportsmen from enjoying themselves in hunting and fishing.

"But as the idea of game restoration spreads over these United States, as the

teachings of the necessity for the preservation of wild life resources are being broadcast, the general public is beginning to say to itself, 'After all there must be something in all this talk about conservation.'

"Conservation is no strange, new cult. It doesn't demote the hardy gunner to a pacifist or cause the ardent angler to scrap his tackle and quit the streams and lakes he loves.

"Conservation doesn't mean restriction. It means common sense preservation. It contemplates more sport for all decent sportsmen. It means taking no more than the game laws say you may take, or, more sensibly, what your own sense of a grub supply and fair play tells you is enough. Conservation means simply the old Golden Rule applied to game and fish and your fellow man. It revives the flavor and romance of the spirit of hunting.

"The conservationist, therefore, is the fellow who is thinking about such matters and trying to interest others in them. He isn't standing around and 'letting George do it.' He is taking an active part in improving conditions in his neighborhood or district. There is absolutely nothing mysterious about conservation."—*DuPont, Promotion News Bulletin*, July 29, 1929.

SALMON SEEK HOME STREAM

It has long been recognized from casual observation that the different species of Pacific salmon resort to certain streams for spawning purposes. Proof of this homing instinct of these fish has been demonstrated by experiments by the Division of Fish and Game in California and additional evidence is now furnished by the United States Bureau of Fisheries as the result of tagging experiments on Chinook salmon in the Columbia River, extending over a period from 1916 to 1927, as related in a recent bulletin of the American Game Protective Association. During that period many thousands of young salmon were marked in the various tributaries of the Columbia and liberated. Many of these marked fish were taken in the sea off British Columbia and southeastern Alaska but it is a significant fact that none have ever been taken in any stream except the Columbia and its tributaries.

It has been an open question as to whether the homing instinct of these fish was a purely hereditary matter or whether it was determined largely by the early environment of the fish. Results of the experiments tend to discount the hereditary theory because only a small percentage of marked fish returned to the tributary where eggs were taken but a

large percentage were recovered in the tributaries where the fry had been liberated and where the young fish spent a portion of their early lives. It is not believed, however, that environment is the sole governing factor but hereditary instinct figures to a limited extent.

A striking instance of the return of fish to the home stream has been found in a tributary called Spring Creek. This creek is so extremely small that it is difficult to see how the salmon could find it at all, yet 82 marked fish were recaptured therein as adults, while only four were taken elsewhere. This is taken as definite evidence of the validity of the home stream theory.

It has also been developed that the homing instinct is disturbed by transplanting the eggs from one tributary to another. This is a matter of considerable importance in fish cultural operations, particularly in cases where attempts are made to rehabilitate runs by transplantation from other streams.

So far as experiments have gone, they indicate that the better practice is to stock each stream with eggs native to that stream.

CONSERVATION BEGINS AT HOME

There are those everywhere who believe that the mere purchase of a hunting and fishing license and the discharge of duties imposed by law completes their obligation. They have no part to play in the actual work of conservation. This view point is most unfortunate. In a very fundamental sense the future of fish and game rests with every citizen and not alone with the state. If those who have the means and the time will devote themselves to the improvement of conditions, will act as game breeders and game keepers for some favorite cover in their own locality, better hunting and fishing conditions will result.

The rancher has in his hands the power to put conservation on a decided improved basis. Living on the land, he is in intimate touch with wild life and "controls the latch string to the hunting fields." He already knows the value of the out-of-doors. Next to food, sunshine and outdoor recreation are the best body builders. The rancher has known this all his life. And because of the obvious presence of health giving opportunities, he fails to justly evaluate them. The same is true of game. It is so close to him that he does not realize that its presence actually increases the value of his land.

One of the stock contentions of the rancher is that conservation is for the benefit of the city man who goes to the country to hunt and fish. Unfortunately,

the rancher has failed to recognize that he actually benefits financially by this. The city man spends money in the country. He must pay for what he eats and where he sleeps. Often he pays for the privilege of hunting on the rancher's land and employs the rancher as guide. Sometimes he builds a hunting lodge and thus creates taxable values. Assuredly, the rancher needs to consider more thoughtfully the very real economic value of the game on his land and the personal losses he will sustain if he neglects to take a direct interest in its conservation. In a sense, the exhaustion of game resources is well nigh impossible if the home guard takes a constructive stand.

TEMPERATURE AND TROUT

Hundreds of millions of young trout have been planted in the streams of the northern states which never developed into mature fish. Blame has been usually placed on predatory fishes and various other unfavorable influences; but according to Jan Metzelaar, biologist of the Fish Division of the Michigan Department of Conservation, much of the fault can be ascribed to unfavorable water temperature.

It is well known that the average temperature of streams throughout the northern states has been raised by the cutting down of the timber which formerly shaded the streams, opening them up to the heat of the sun; and it has been the general belief that the colder the water the better for trout. This is not necessarily true. The trout of our northern waters would thrive no better in streams of arctic temperature than they do in the heated, sluggish waters of lowland rivers. They shun extremes of both heat and cold.

It has been found that trout do best where conditions are such that the day maximum temperature doesn't exceed 68 degrees and the daily variation is not great. In hot weather, when the temperature rises above that in the main streams, the trout seek protected holes where spring seepage comes in. Spring holes frequently lack a sufficient supply of food, however, so that the trout are obliged to seek the warmer water or starve.

The biological study of the streams of Michigan which is being made by Mr. Metzelaar discloses a vast amount of information important to fish culturists and, incidentally, the angler. The varying temperature of streams is of more fundamental importance than almost any other factor, it is believed, and is something which must be brought under control in order that streams may maintain a maximum fish population.

The control of temperature involves the planting of a fringe of brush or small trees along the banks of small streams which are barren, in which the cooperation of landowners is necessary. One of the chief objectives in the control of temperature is to avoid extreme changes.—*Field and Stream*, Aug., 1929.

PREDATORY ANIMAL CONTROL

In view of the numerous letters received by the division protesting against the poison campaigns directed against predatory animals, readers should be interested in the following paragraphs taken from a defense of work of this kind by Paul G. Redington, chief of the U. S. Bureau of Biological Survey:

"From the very inception of the Biological Survey's cooperative work in predatory animal control, the interests of fur bearers have been carefully considered, both in planning and in conducting the field operations, because it was the desire of the bureau to keep the destruction of such animals down to a negligible minimum. Because of the great abundance of coyotes, the serious losses occasioned by them to the live stock industry, the fact that they are carriers of rabies, and because of their prolific breeding, it was early realized that if control was to be effected with any degree of success in those areas of heaviest infestation, poisoning operations would have to be resorted to. Consequently, after years of experimentation, there has been developed an effective poisoning system, the use of which in cooperation with those most vitally concerned is slowly but surely bringing coyotes under control in many of the western stock ranges. The ultimate control of the coyote, however, will call for persistent cooperative action for many years to come.

"In carrying out these poisoning operations against coyotes, the utmost care is exercised at all times to prevent careless or indiscriminate use of the poison. Any fear, therefore, that this organized work may open the way to the indiscriminate distribution of poison on the part of persons who are unskilled in its use, or who are careless or wholly unqualified, is without foundation.

"Poisoning operations under the system followed by the Biological Survey are not undertaken on any area where there is the least danger of poisoning fur bearers, but instead, trapping methods are used there. Records on file in the bureau and statements from stockmen on whose ranges poisoning work has been conducted, do not support the contention that many hundreds of fur-bearing animals are killed to every coyote that is destroyed by the

poison bait. Nor has there been any concrete proof presented, other than unsubstantiated written charges, or brought to our attention, in spite of our many requests for proof, that any appreciable damage to fur bearers is resulting because of the application of poison methods.

"Many complaints that minks, martens, fishers and other valuable fur bearers were being destroyed through poisoning operations have been carefully investigated, only to find them without adequate foundation. Trappers making such complaints have been requested to produce evidence in support of their claims, but they have failed to do so. It is very seldom necessary to resort to coyote control by the poisoning methods in the habitat of the true fur bearer."

METHOD OF WHOLESALE CONTROL UNWISE

"More and more those who have studied vermin control are voicing the warning that extermination is a pruning device to be used with care and caution. Vermin play a necessary role in 'nature's eternal economy' and examples are no longer rare where their wholesale destruction over widespread areas was later regretted and uniformly condemned.

"Localities differ in their myriad interdependent relationships, and methods of control effective in one area may be tragic in another. For this reason the problem is essentially a local problem, requiring not a hasty and indiscriminate slaughter, but a careful investigation or interrelations and an accurate understanding of the amount of harm species injurious cause to those beneficial."

BUREAU OF LAND AND GAME REFUGES

One of the most important projects undertaken by the Division of Fish and Game in recent years is concerned with the purchase and development of game refuges. At the 1927 session of the state legislature the Hunting License Act was amended to provide for one-third of all moneys collected annually from the sales of hunting licenses to be expended in the purchase, lease or rental, and the development, improvement, maintenance and administration of land, or land and water, or land and water rights therefor, suitable for game refuges or public shooting grounds, or both, within the State of California.

A committee was appointed to assist in selecting areas. Now that actual purchases are being considered, it is important that all of the work connected with these new refuges, and with some

thirty already in existence, should be placed under the control of a separate bureau. Such a bureau has been established, and J. S. Hunter, who has supervised this work for some time, is now officially in charge of all the refuges of the state.

HYDROBIOLOGICAL SURVEY CONTINUED

The hydrobiological survey of Monterey Bay will be continued for at least another year by the division through its Bureau of Commercial Fisheries, in conjunction with the Hopkins Marine Station at Stanford University, located at Pacific Grove on Monterey Bay.

The survey is of great value and importance scientifically and will benefit the commercial fisheries of the state. It will permit more knowledge to be gained about ocean currents, temperatures and changes in sea water. It will give an understanding of the fluctuations in the abundance of the minute animal and plant life of the sea upon which so many fishes of commercial importance depend for food. An understanding of these variable factors is believed to be necessary. It is expected they will serve to explain the sudden disappearance and equally as sudden appearance of sardines.

Already the eggs and larvae of sardines have been discovered. This is expected to lead to a better understanding of the areas in the open sea where sardines spawn and of the spawning migrations of the adults. It is the opinion of the investigators that comparative observations of each year's spawning of sardines will throw light on the abundance of each yearly increase so that predictions can be made several years in advance of good canning seasons.

It is also expected that the survey will help to solve the very interesting question whether excessive fishing at Monterey has an effect on the abundance of sardines at San Pedro or if the supply at Monterey in any way is modified by the amount of fishing at San Pedro.

SIZE LIMITS IMPORTANT

The establishment of a size limit in the taking of fish, shellfish and crustaceans is being given a fair trial in California. It seems reasonable that a size limit is an effective means of assuring a breeding stock. In the case of the spiny lobster there is both a maximum and minimum size limit (10½ and 16 inches). This law gives protection to the young and also to the oldest and heaviest egg layers. In the case of the Pismo clam, the minimum

limit of five inches protects these shellfish until they have spawned at least once. It seems difficult to see how a species so protected could ever actually be exterminated.

THE DEER SEASON

The deer season did not open as auspiciously this year as in the past. Hunters reported having more difficulty in finding bucks. Scarcity was also evidenced in the lighter returns of deer tags.

The importance of accurate aim by the hunters was evidenced in Marin County when a fine three-point buck was reported seriously wounded. Volunteer Warden Mrs. Walter B. Sellmer investigated and put the animal out of its misery. It had been shot through the left ham, the wound had become badly infected and fly maggots were at work.

In contrast to the adverse reports on abundance of deer this year has been the flood of complaints of damage to crops. Deer are accused of destroying alfalfa, fruit trees and even gardens in such populous centers as Ross, Marin County.

BOUNDARIES OF GAME DISTRICTS DEFINED

In order that whatever confusion may exist in the minds of hunters and sportsmen in Siskiyou County, boundaries of the fish and game districts and changes made in the law at the last session of the legislature were explained by Division of Fish and Game officials here.

The portion of Siskiyou County south and east of the Klamath River from the Oregon line to the Southern Pacific Railroad bridge near Klamathon and east of the Southern Pacific tracks from this bridge to the south line of the county is in fish and game district one and three-fourths, except that all incorporated cities and towns through which the Southern Pacific tracks pass are included in fish and game district one and one-half. All other portions of Siskiyou County, including the incorporated cities and towns mentioned above, are in fish and game district one and one-half.

Each fish and game district carries with it the bag limits and seasons prescribed by law in that particular district, which means that in district one and one-half the deer season opened on September 1st and the limit is two bucks, no fawns, does or spiked bucks allowed in possession, and sale of venison or deer skins prohibited.

In district one and three-fourths the deer season opened on September 16th and the limit is one buck, but no does, fawns, spiked bucks or forked-horn mule

deer are allowed in possession, while the sale of deer meat and deer skins is prohibited.

FOREST FIRES AND GAME

While certain problems concerned with game management may be little understood, almost everyone is familiar with the relation of forests to game. It is common knowledge that forests are not mere collections of trees, but afford food and safety for animals. Useful to man and serving as places for relaxation and inspiration, forests create and regulate conditions indispensable for game. Wholesale destruction of the forest effects a mass change of the environment of animals and directly influences their living and breeding.

Yet in spite of the widespread understanding of the menace of forest fires, man-caused forest fires continue in California to head the list. Smokers and incendiaries were responsible in 1928 for 50 per cent of all the fires that occurred in the state, for 68 per cent of the total area burned and 71 per cent of the total damage done.

Figures issued by the United States Forest Service and the State Division of Forestry show that during the last nine years 24,123 fires have raged in California, burning 7,255,979 acres. It is estimated that the cost of preventing and suppressing these fires totaled a staggering figure of \$7,705,475.

Despite federal regulations prohibiting smoking in national forests and state laws against the throwing of lighted cigarettes and matches from automobiles and other moving vehicles, those who are out of doors continue to discard lighted matches, cigarettes, cigar and pipe heels in forest, brush and grass areas with the same unconcern as they do on paved streets. Surely Californians and sportsmen in particular, need to develop a "smoker's conscience."

THE CREEL LIMIT ON TROUT

Anglers have requested an interpretation of the law governing the creel limit on trout. Section 632 (a) of the fish and game laws reads: "* * * Bag limit not more than twenty-five trout or more than ten pounds of trout and one trout in any one calendar day * * *."

This means, according to the Division's ruling, that an angler may take exactly ten pounds of fish or less and still be entitled to another fish. However, in case he has either one, two or more fish and the weight is more than ten pounds, he is not entitled to another fish, but has his limit for that day.

Suppose an angler catches a fish weighing five pounds, and another weighing five and a half pounds. Is he entitled to another fish? Not according to the ruling of the Division. The two fish already caught make up his limit for that day. He violates the law if he catches another fish.

Anglers are also advised that the limit on golden trout is not more than twenty trout or more than ten pounds and one trout, and the size limit is not less than five inches.

OUR MEN ON PATROL

Too often it is the belief of men who hunt and fish for pleasure that the men who patrol the woods and streams for the Division of Fish and Game are actuated solely by an ambition to make arrests. Too often, it can be said, but, happily, that is not the belief of every man who seeks pleasure with the rod and gun. Many there are who cooperate gladly with the men on patrol, and the number is growing annually, as the tenets of the creed of these patrolmen become more generally known. More and more they are coming to be known as protectors of the wild life of a great state.

What does the public they serve think of them? Does the work to them seem like most other jobs—a matter of dollars and cents? Ask them, and they will tell you quickly and honestly that their incentive is of a vastly different nature.

The older men of the force, their hair shaded with gray, their faces weather-beaten and grim—marked by exposure and strain—they will tell you they have given the best in their lives to the work—and not for dollars. They love the work, and few of them resign.

The younger members of the patrol go about their work of protecting the wild creatures, little realizing, as time glides along, that they, too, are giving their lives to a great cause. They are found trudging fearlessly and hopefully toward a goal that will assure the preservation of our fish and game for all time. That is the big thing in their work—the theme and motif of their activities. The arrest of those who wantonly and unlawfully destroy the lives of the dumb creatures who have as much right to life as their slayers is but an incident in the big campaign. The life holds the patrolmen, and from the time they assume their duties until the end of their employment, for whatever reason, they give everything and ask nothing but a living, that they may pursue their work.

They talk, think and dream of their work. They may be found at all hours

of the day or night, often cold, wet, tired and hungry, on duty, watching patiently for hours for a man who is trying to circumvent them and the law by killing a protected animal, or "getting" more than the fixed limit. There is danger. Patrolmen have been slain in the performance of their duty. But the others go on, impelled by their sacred obligations and the desire to accomplish the end which should be the goal of every man, woman and child who has a spark of love for creatures that have been placed here for us to protect.

And there is a thrill, also, in their work. That thrill is compensating and necessary to success. To one who gives a listless attention to the affairs of his district, there is but one end. He fails. Without a love for his work, his usefulness has been outlived. The earnest, honest and square patrolman finds cooperation among the earnest, honest and square sportsmen, and their admiration is mutual. Working together, they can attain the end desired by both—a respect for the law, and an innate sense of fairness to the creatures that look to man for a square deal, that they may be with us while man remains.—W. B. SELLMER, Fairfax, California.

WHALES COMMERCIALLY EXTINCT ON CALIFORNIA COAST

For the second time in history, there are not sufficient whales along the California coast to support a whaling industry. In 1865, there were eleven whaling stations located on the coast of California. A sizable fleet of ships was employed in the whaling operations. Writers often mentioned seeing fifteen whales at one time in one place. One writer states that "hundreds of them can be seen spouting and blowing along the entire coast." In 1886, the number of whaling stations had been cut to five: those at Monterey, San Simeon, San Luis Obispo, Point Conception and San Diego. By 1890, practically no whaling was possible along the coast although San Francisco was still the base port for a considerable number of whaling ships. Their field of operation, however, was far from the coast. The decline in whaling became particularly noticeable about the year 1880. The California gray whale was one of the first to become scarce, although in 1853 it was estimated that "fully 30,000 California gray whales visit the California coast annually."

Beginning in 1919, commercial whaling was again undertaken at Monterey Bay. Large steam whalers with a hundred mile cruising radius were utilized. Instead of a harpoon, a brass gun was used to shoot

a bomb which nearly always proved fatal. In these more recent operations only four or five California gray whales were taken. On the other hand, 781 humpbacked whales were secured inside of three years. After less than ten years of operation, the Moss Landing whaling station has been dismantled and operations abandoned because of a lack of whales. The whale is a slow breeding mammal, and if certain species are not already extinct and therefore impossible to reestablish themselves it will take any species many years of total protection to recuperate. It is perhaps a fortunate thing that demand is not sufficient to endanger still more greatly the breeding stock. No laws have yet been enacted in this state which curtail the catch or give other protection to whales.

In spite of depletion everywhere whales are being killed at the rate of 30,000 per year. In many places the world around certain species are already on the verge of extinction and the scarcity of others is becoming alarming, all because the annual kill is greater than the natural increase. The young are born only every other year; consequently, natural recovery is slow.

International action is required to secure the measures of protection that are necessary, which include absolute protection of certain species, protection of all species on their breeding grounds, protection of nursing females, compulsory utilization of the entire carcasses (much now being wasted), prohibition of whaling in tropical areas, prohibition of the use of airplanes in whale hunting and an international system of supervision of pelagic whaling.

The American Society of Mammologists has instituted a movement to secure international action by the creation of a council for the conservation of whales and other marine mammals with headquarters at Johns Hopkins Medical School, Baltimore, Maryland. On this council are representatives of all the conservation organizations of this country concerned in preservation of wild life, besides individuals who have a special interest in this particular movement. The advisory board of the council includes the names of Glover M. Allen, president of the American Society of Mammologists; Madison Grant, president of the New York Zoological Society; Gilbert C. Grosvenor, president of the National Geographic Society; David Starr Jordan, president emeritus of Stanford University; Vernon L. Kellogg, National Research Council; John C. Merriam, president of

Carnegie Institution of Washington; Henry Fairfield Osborn, president of American Museum of Natural History; and many others equally prominent and influential.

Plans for the creation of an international advisory board to carry on the campaign in all countries concerned are being worked out and encouraging response is being received from other countries. The American Game Protective Association has accepted appointment of its president as the association's representative on the advisory council.

NEW DANGER THREATENS WESTERN DEER AND ELK

A number of reports have come to the American Game Protective Association of the death of mule deer in the West which has been attributed to head maggots. Inquiry of the U. S. Bureau of Entomology elicits the information that there are two or more distinct species of nose flies that affect deer and elk in this country. The life history of these is not well understood but presumably the young are deposited as minute active larvae in the nostrils of the deer. These larvae immediately work up the nasal passages and attach in the nose, throat and sinuses of the head, where they complete their development in about a year and drop out as full grown spiny larvae about two-thirds of an inch in length. These in turn transform on the ground to flies which, after mating immediately, begin to attack the hosts. The presence of these larvae in the heads of the animals causes irritation and sometimes pus formation is induced. These larvae would naturally tend to lower the resistance and condition of animals affected so that they might die from other causes.

What can be done to bring these insects under control is a question which can not be answered until they have been more carefully studied. Post mortem examinations of deer which died in the Gunnison forest last winter showed that head maggots were possibly a contributing factor in these losses. Animals so affected lose their appetites, become emaciated and fall easy prey to any adverse factors such as severe weather and feed shortage.

It is said by those who have made investigation that the species of fly which infests the deer is not the same that attacks domestic sheep. So far as known the species found in deer does not attack sheep but it has been identified as the same species that attacks the reindeer of Alaska.

WATER FOR QUAIL

For several years R. J. Little of Banning, deputy of the State Division of Fish and Game, has been impressed with the loss of game birds, especially quail, in the desert sections of Riverside and San Bernardino counties, through lack of water. Recently he found two new and enthusiastic Izaak Walton chapters in the section looking about for a place to expend their energy and their money, and filled with a thirst for "conservation." On his

Consequently, for the first time in California, troughs have been built at The Tanks, Quail Springs, Warrens Wells, and the Pipes Wash Well, on the desert east of Morongo Valley, for the convenience of the game birds, by the San Gorgonio and Redlands chapters of the Izaak Walton League. The troughs are oval in shape, made of cement, with shut-off valves to prevent waste, and will hold about one and one-half inches of water. Special attention was paid to placing

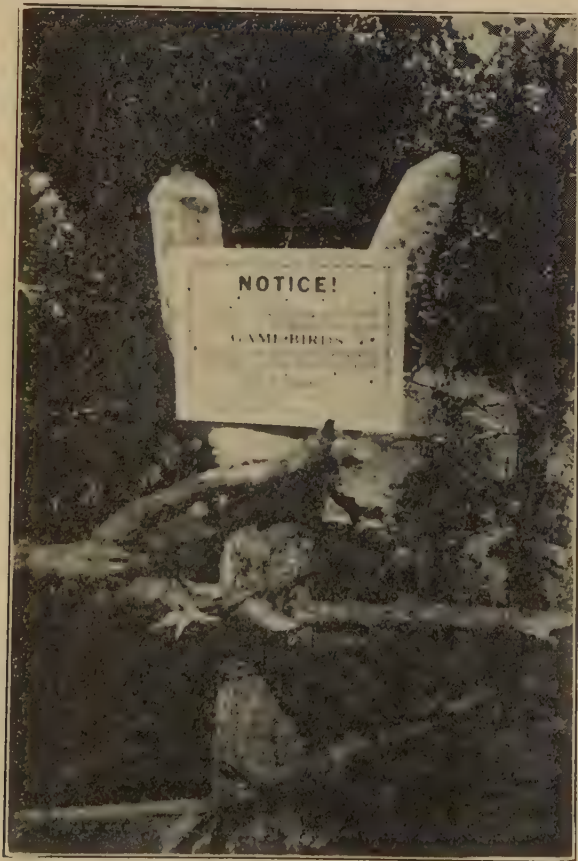


FIG. 110. Watering place for quail at "The Tanks."
Photograph by R. J. Little, May 12, 1929.

trips to the desert in the past years Game Warden Little has found hundreds of young quail either drowned in the larger cattle troughs, where they have been attempting to drink, or dead for lack of water. These tiny denizens of the wilds were sacrificed to the fact that there had been no overflow in the desert watering places since the "dry years" have prevailed. Mr. Little saw a splendid opportunity to turn enthusiasm into action.

them under bushes or under a built shelter so that "Old Man Hawk" can not swoop down for his "daily dozen" as the small birds are drinking. The troughs are also fenced to keep cattle from destroying them. The hearty cooperation of Talmadge Brothers, large cattle ranch operators in the desert section, and of other property owners there, has been secured for this unique project. The members of the San Gorgonio Chapter of

the Izaak Walton League, which includes citizens of Banning and Beaumont, and members of the Redlands chapter are watching the outcome of their conservation project with much interest.

At each trough this sign is placed:

"NOTICE!

This Water Trough was placed here for the Convenience and Protection of our

GAME BIRDS

Courtesy of the San Geronio and Redlands Chapters of the

IZAACK WALTON LEAGUE.

BE A SPORT

Do not shoot or disturb birds at this trough."

According to Game Warden Little, these watering places should be the means of saving thousands of birds in a few years. Moving pictures and stills were taken of the troughs which are proving most interesting to lovers of wild life everywhere.—Mrs. R. H. Combs, Banning, California.

THE VALUE OF THE WILDERNESS

The value of the wilderness must be judged ultimately by its contributions to social welfare. We have no better criterion. What, therefore, are some of the benefits? First of all let us turn to our own history for a few suggestions. Our American public first learned of natural conditions during its pioneer history. Historians have shown us how much our American democratic institutions have been a direct outgrowth of our pioneering, and how this has tended to encourage independence, self-reliance and other traits which have contributed so much toward our institutions and our ideals. There is a whole literature built upon this phase of our national life. Without question this background and our public domain, out of which we could, with relative ease, set aside national parks and national forests, have been dominating influences in acquainting Americans with the charm of the wilderness. Our first and greatest champion of all this was John Muir, who exemplified the benefits derived from the appreciation of the wilderness. He was a naturalist, an artist, and from the wilderness he derived

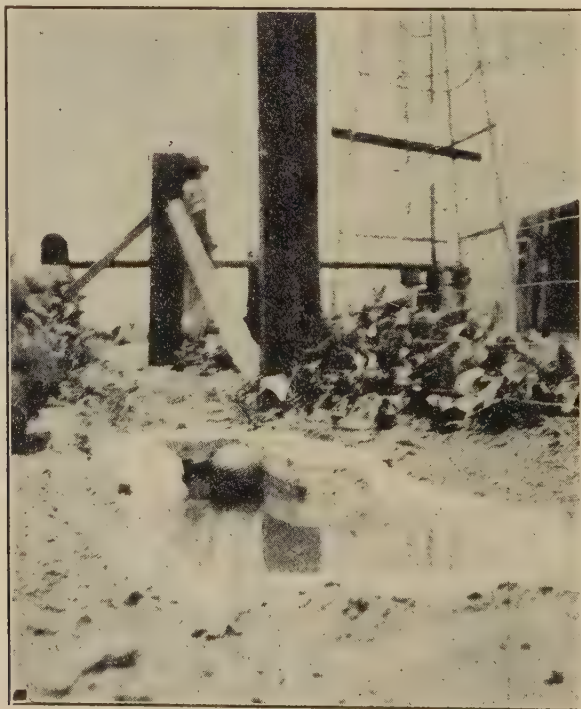


FIG. 111. Watering place for quail at "Warren Well."
Photograph by R. J. Little, May 12, 1929.

science, art, education, recreation, producing a literature which is a wonderful blend of all these. He thus exemplified the social uses of the wilderness at its best. This great contribution could not come from one dominated by economic ideals. A whole nation is now becoming educated to the Muir ideal and, as has been said, this is one of America's large and original contributions to the use of the land, as a definite land policy. This is a policy which has since spread to the Old World and seems destined to have a great future there.

We may briefly summarize the value of natural conditions under the following heads: artistic, scientific, educational, recreational and economic, bearing in mind, of course, that these groups grade imperceptibly into one another in various directions.—The Importance of Preserving Wilderness Conditions, By Charles C. Adams, New York State Museum Bulletin 279, 1929.

SEA LIONS WRONGFULLY ACCUSED

Commercial fishing interests have for a long time denounced the colonies of sea lions which exist on the coast of southern California claiming that they are very destructive to fish and are injuring the fisheries interests. An investigation of this claim has been made by authority of the California Division of Fish and Game and it has been found that the charges against the sea lions are greatly exaggerated. Two extensive counts were made of the sea lions on the California coast, as well as a survey of their habits and food requirements. It was found that there are about 6000 sea lions of two species on the entire coast of California between Oregon and Mexico. While fishermen claim that sea lions consume about 50 pounds of fish each day, records of feeding these animals in captivity indicate that they eat from eight to 16 pounds a day. It is also found that most of the fish they consume are not of the more desirable species but consist chiefly of so-called rough fish of little commercial value. They also feed upon other organisms that are of no value and some of which are injurious to fish, and it appears from the investigation that the sea lions may be of more benefit to the fisheries interests than otherwise.

Reports and records compiled for a period of years indicate that the colonies of sea lions are growing smaller in numbers annually.—Bulletin of the American Game Protective Association.

LION BOUNTIES INCREASE

For the fiscal year ended June 30, 1929, there were turned in for bounty 333

lions. This is 18 more than for the year 1927-28, and 103 more than for the year 1926-27. During the first seven months of 1929, 222 lions have been submitted for bounty—97 males and 125 females. If the kill is average for the last five months of the year, the total for 1929 will be 331, well over the average number turned in annually for bounty.

COMMITTEE APPOINTED TO ADMINISTER MIGRATORY BIRD CONSERVATION ACT

The commission provided for under the migratory bird conservation act passed by the last session of congress includes three members of the President's cabinet, who serve ex officio, and include the Secretary of Agriculture, who is chairman of the commission, the Secretary of Commerce and the Secretary of the Interior. In addition, two members of the senate and two members of the house of representatives are made members of the commission to be named by the vice president and the speaker of the house. The two senators appointed are Peter Norbeck, South Dakota, who was the author of the senate migratory bird refuge bill, and Senator Harry Hawes, of Missouri. The house members appointed are Congressman Ernest R. Ackerman, of New Jersey, and Congressman Sam McReynolds, of Tennessee, says a bulletin of the American Game Protective Association. The duty of this commission is to pass upon the purchase of lands selected by the Bureau of Biological Survey as suitable for migratory bird refuges. It is anticipated that two or more refuges will be selected for each state, due consideration being given to the areas frequented by the birds for wintering and routes taken by them in their migratory flight. The migratory bird act provides for the expenditure of an appropriation of more than \$7,000,000 to be expended over a period of ten years."—*Science*, vol. 69, p. 620.

FORT SEWARD HATCHERY TRIES NEW FISH FOOD

For some time there has been carried on at the Fort Seward Hatchery a trial of salmon offal (intestines, internal organs, etc.) as food for trout and salmon. This food has been obtained from the Gold Beach Packing Company at a cost to cover overhead, which will be less than 5 cents per pound landed at the hatchery. The product is frozen the same day that it is removed from the fish at the packing house. A report will be made later as to the results, but already it is believed to be of value, for it contains many necessary elements, both chemical and organic. It

has an especial value in that the vitamine content, which is large, and in a medium that the fish recognize as food. Also, the many hormones of the endocrine system, which are present, are extremely valuable for growing fish.

STATEMENT OF THE AMERICAN MUSEUM OF NATURAL HISTORY IN REGARD TO A PAMPHLET ENTITLED A CRISIS IN CONSERVATION.

The attention of the American Museum authorities has been called to a privately issued pamphlet entitled "A Crisis in Conservation." Two of the three signers of this document are members of the scientific staff of the Museum and this connection has led a number of people to inquire whether the Museum approves of the views to which this pamphlet gives expression. The Museum wishes, therefore, to put itself on record in a manner which will leave no doubt of its attitude toward this publication:

First.—The Museum was wholly unaware that this pamphlet was in course of preparation and had no knowledge of its existence until it was issued.

Second.—The Museum not only does not approve of this pamphlet but believes that it will convey a wholly false impression of the existing state of affairs in the conservation of bird life, and by discrediting the efforts of organizations whose records of achievement are unquestioned and worthy of all support, it feels that this pamphlet may do much harm.

After making careful inquiry, the authorities of the Museum find that, with the exception of the two signers of this pamphlet, the members of its staff whose experience and sources of information entitle them to an opinion, agree that there has never been a period in the history of bird protection when our laws were more far-reaching, better enforced or more strongly endorsed by public opinion. It is inevitable that some species of birds must vanish as the advance of an increasing population demands their haunts. But never before have such large sums been expended or such widespread efforts been made to stay the destructive agencies of the day. The Museum is, therefore, of the opinion that the alleged "Crisis in Conservation" exists largely in the minds of the authors of this pamphlet.—(Signed) Geo. H. Sherwood, Director.

AIRPLANE "SMOKES" MENACE CALIFORNIA FIELDS AND FORESTS

The fields and forests of California, which are yearly swept by hundreds of conflagrations started by careless motor-

ists, campers and sportsmen, today face a new and startling menace in the form of burning tobacco thrown from airplanes, according to the United States Forest Service. Information has already been received this season by the State Division of Forestry of a number of large grain and grass fires in the interior valleys of the State that were reported to have been started by cigarettes or cigars thrown from airplanes and which resulted in serious loss of range feed and farm crops.

Many people, who evidently fail to appreciate the fire hazard occasioned by high temperatures, low humidity and dry winds which occur during the summer months in the valley and forest regions of the State, have expressed doubt that a cigar or cigarette butt thrown from a swiftly moving airplane would continue to burn until it reached the ground, claiming that the propellor blast and air currents would snuff out the fire.

To secure reliable information on the subject, the United States Forest Service recently made a series of experiments at the Spokane, Washington, airport, using a regular forest patrol plane with a pilot and two observers, and ordinary cigars and factory-made cigarettes with plain paper tips. Tests were made at altitudes of 500 to 1000 feet on a clear day with a temperature of 75 degrees Fahrenheit, relative humidity 34 per cent, and wind velocity 7 miles per hour. To enable the ground observers to trace the cigars and cigarettes thrown from the plane, a bright colored cotton streamer two to three feet long and about one inch wide was attached to each "smoke." Employees and students of the Mamer Flying Service and officers of the Forest Service were present as witnesses to the tests.

The Forest Service reports the results of the tests as follows: Cigars: Six dropped; five recovered. All burning when picked up from the ground. Cigarettes: Seven dropped; six recovered. Four burning when picked up; two out.

The time which elapsed between the dropping of the "smoke" and its recovery on the ground varied from one to three minutes. Within this relatively small range the time element appeared to have no significance. Neither did it appear that increasing the altitude from 500 to 1000 feet was an important factor. No fires were started by the cigars and cigarettes as the tests were made on an airport field with a sparse cover of green vegetation and at a time when the relative humidity was high (34%).

These tests, Forest Service officers claim, prove rather convincingly that at alti-

tudes up to 1000 feet a large percentage of "smokes" thrown from airplanes will still be burning when they land on the ground, and that with favorable fire weather conditions lighted cigars and cigarettes thus discarded may cause serious forest, grass and grain fires.

All air mail, commercial and passenger-

carrying aviation companies will be requested to adopt strict measures to prevent the throwing of burning tobacco from their planes, since such action is not only a serious fire menace but is also a violation of California laws prohibiting the throwing of burning or inflammable material from any moving vehicle.

DIVISION ACTIVITIES

Bureau of Finance

Deer tags to the number of 150,000, valued at \$150,000, were distributed starting the early part of July. Due to their shape and the fact that each has a metal eyelet in order to attach to one-half of tag to a deer when it is killed, they were very difficult to handle. However, the tags were sent to the various branch offices and to the county clerks in ample time for sale before the opening of the season in Districts 2 and 3.

H. R. Dunbar and Leslie Rust both testified in the Mendocino superior court in the case against W. H. Prather, former county clerk, indicted by the grand jury for failure to account for fish and game funds received for the sale of fishing and hunting licenses for 1928 and 1929. Prather was convicted and sentenced by Judge Preston to serve from one to five years in San Quentin. His attorneys have appealed the case.

It appears from figures in the finance department that the sale of hunting licenses, deer tags and angling licenses for 1929 will exceed the sale for 1928.

Bureau of Patrol

During the first three months of the last quarter 656 arrests were made for violation of the fish and game laws. Court action in these cases resulted in fines totaling \$20,239 and ten men were sentenced to 438 days in jail.

The opening of the deer season on August 1st, increased the work of the department extensively, and a heavy force was thrown into the field before the hunters started the annual bombardment.

Numerous arrests were made, many for failure to properly observe the provisions of the deer tag law, and some for the killing of does, fawns and spike bucks.

In Santa Cruz County a deputy learned after the season opened that a doe had been killed on July 31. Working quietly he located three men, one of whom admitted killing the doe, while the others pleaded guilty to pursuing the deer. The first was fined \$150, one of the others \$200 and the other \$250.

Another deputy in the same county arrested a violator with six sprig ducks and in court this offender paid a fine of \$300. An overlimit of salmon found in Fresno County was responsible for a fine of \$100, while there were numerous heavy fines for over the limit on trout. The possession of Pismo clams in District 17 cost the offender \$300.

June and July each had fifty violations of the abalone law that were brought to book. In May, thirty-four were arrested for the same offense. This appears to be the most popular violation. Violation of the angling license act caused 108 arrests in the three months named.

Five deputies who failed to pass their civil service examinations were released from the service on July 31.

Ten deputies have been supplied with new Ford coaches and reports indicate the cars are giving good satisfaction. The cars have been supplied at Yuba City, Sutter County; Stonyford, Colusa County; Truckee, Nevada County; Mt. Shasta, Siskiyou County; Eureka, Humboldt County; Rocklin, Placer County; Fresno, Fresno County; Sebastopol, Sonoma County; Alturas in Modoc County and at Independence, Inyo County. This test will determine whether it is more economical for deputies to use State owned or privately owned automobiles for patrol work.

The following men have been added to the patrol force at the places named: Frank A. Carillo, Angels Camp; Harold R. Botts, King City; Walter Goff, Paso Robles; Floyd Jones, Merced; Charles R. Love, Redding; Joseph L. Ahart, Crockett; C. Scott Feland, Fortuna and Vernon R. Sutton, Kernville. Charter R. Peek, San Francisco office.

Acting as an observer of fire conditions from an airplane, fighting fire, working as dispatcher in the United States Forest Service, assigning men and supplies, also taking care of his own duties, gave Deputy A. A. Jordan of the Fish and Game Division, a few busy days starting July 22d.

On this date the Fandango fire broke out near Alturas in Modoc County, which is Jordan's territory. The deputy imme-

diately reported for service to the forest headquarters and was given the various duties mentioned above.

For three days Jordan worked day and night, but he also had time to take a look at fish and game conditions, as his weekly report shows that his observation and information gathered from eye witnesses indicates that over 100 deer, mostly fawns, perished in the fire which swept over 9000 acres in less than five hours, where the young deer were an easy prey to the fire demon due to heavy undergrowth which covered the section in the path of the flames.

A brief summary of the monthly reports received from the volunteer deputies between January 1 and July 1, 1929, indicate that during the past six months they have patrolled 294,701 miles of fields, streams, coast line and bay shores, checked 9419 hunting and angling licenses, and made and assisted in making 105 arrests, for which fines in the sum of \$4,219 were imposed.

With the opening of the deer season, volunteer deputies assigned for duty with the regular patrol cooperated in excellent fashion, and as a result of this work a number of good cases were made; in one case a fine of \$600 was assessed against violators run down by a regular deputy assisted ably by a volunteer.

Bureau of Commercial Fisheries

The first month of the sardine canning season at Monterey has closed with conditions between the cannery and the division in full harmony. The cannery have had many problems to solve, but have been packing the full amount of fish called for and are assisting every way to enforce the law adopted at the last session of the legislature.

Two new canneries have been constructed at Monterey and started operation shortly after September first. They are the Customs House Packing Corporation and the Monterey Sardine Products Corporation. Phil H. Oyer, former employee of the commission is an official of the Customs House Corporation which has put up a fine plant. The main building is 325 by 100 feet and two stories in height. A 60 by 100-foot warehouse has been built across the street connected by a bridge. This plant adjoins the Carmel Canning Company establishment.

All canneries have made extensive improvements this season. All of the plants hope to lessen the cost of packing by the installation of labor saving devices and the latest in modern machinery. Suction unloading tubes are in operation at several of the plants.

This season there are a number of purse seine boats operating for Monterey cannery, in addition to the lampara fleet. The purse seiners can handle a much larger catch and the cannery anticipate no trouble in getting enough sardines to carry on operations throughout the season.

The first albacore was taken off San Diego on July 4th. The catch throughout the month, however, was light, 700 or 800 pounds being high boat for the day's catch. The fish average in weight from 17 to 18 pounds and the price to the fishermen has been \$300 per ton.

Mackerel are being packed at most of the San Pedro and San Diego plants.

The salmon catch at Monterey was light during July, fishermen averaging about 100 pounds to the gig boat.

The *Albacore* was hauled up for repairs on the sixth day of July. She was in commission again on the fifteenth and left immediately to carry on work planned for the laboratory, after completion of which the boat was used in patrol work in the northern part of the district around the islands and in the vicinity of San Diego.

During August thirteen cannery inspectors were working at Monterey, checking the weights of the canneries to see that the law passed at the last session of the legislature was complied with, regulating the use of sardines in reduction plants.

On July 31st, Captain Dollard of the American steamer *Makawao* reported that while approaching San Francisco about 100 to 150 miles offshore he encountered thousands of dead fish floating belly up. It was difficult to distinguish the species of fish, but they appeared to be salmon ranging from 2 to 2½ feet in length. By arrangement with the Coast Guard service, a special trip was made in the Coast Guard boat *McLane*, with E. C. Scofield aboard. The area was completely encircled where the fish had been reported seen but only one dead fish was found,

and that could not be recovered. However, much was learned about ocean temperature. It was found that there is a cold body of water extending out about thirty-five miles west of San Francisco, and that beyond that point the water is about seven degrees warmer. The cold inshore water is caused by the upwelling of abysmal water, due to the action of the winds. It is believed that the fish were killed by suddenly running from warm water into the cold, as it is well known that fish do not stand a sudden change from warm to cold water.

Bureau of Fish Culture

During June and July fish planting was started in real earnest. Fish cars operating from the Shasta Hatchery worked day and night to transport fry to various points in California for distribution in selected places.

This season the fish planting is being done through the cooperation of the fish-culture department and the patrol department with the assistance of hundreds of members of sportsmen's organizations and other citizens interested in the stocking of the streams of the state.

For the two months figures show that a total of 15,691,645 fry have been planted throughout California. The fish planted are as follows: Eastern Brook, 1,623,050; Loch leven, 3,137,095; Rainbow, 3,888,000; Steelhead, 4,344,000; German brown, 582,500; Black Spotted, 1,052,000; Cutthroat, 65,000; Large Lake, 1,000,000.

George A. Coleman has made an extensive biological survey of various streams, in order to determine what fish should be placed in these streams, and to gather data regarding feed and other conditions.

At the start of the season it was found that salmon fry on hand available for distribution numbered 6,283,920.

The foreman of the Prairie Creek hatchery, J. C. Lewis, reported a serious epidemic among the Atlantic salmon which were being reared at that station. Though the loss was heavy, the 3,000 remaining after the epidemic ceased have grown rapidly and are in prime condition for planting.

It appears from this report that these fish are not resistant to the organisms existing in western waters. Great care was exercised in the handling of these

fish from the time the eggs were received, but it was difficult to check the epidemic after it got a start.

In July, it was reported that water conditions at the Bear Lake district are very poor and the lake is falling rapidly. It has lowered about three feet since the first of May. Most of the streams of southern California are very low this year, and some trouble will probably be experienced in planting the fish. Due to so many streams drying up this fall, trout will have to be planted in streams where there will be water enough to support them.

Bureau of Education and Research

Through the aid of the bureau, a class of twenty students in Yosemite was given a complete training in natural history and conservation and sent back to their homes to help build up a favorable conservation sentiment. A larger number of vacationists than ever before attended the lectures and the field trips given. Special camp fires were started in two of the public auto camps and each night a nature guide gave a talk to the groups assembled. Better opportunity to receive instruction was afforded visitors at such outpost stations as Mariposa Grove of Big Trees, Glacier Point and Tuolumne Meadows. The new aquaria at the Yosemite Hatchery have added greatly to the educational possibilities of this fish propagation plant.

H. L. Bauer and Miss Nancy Yerkes handled a splendid educational program in California State Redwood Park. During the month of July over 14,000 visitors were served. Attendance on field trips mounted to over 1500 adults and 273 children. During August the total attendance was 12,617.

Emphasis on certain mountain counties where residents are in intimate touch with game has been given in the lecture program. Early in May, through the good efforts of Mr. D. Fricot, of Angels Camp, opportunity was given to reach the principal centers of the Mother Lode. Addresses were made by Rodney S. Ellsworth before the San Andreas Progressives, the Angels Camp Boosters, and a meeting sponsored by the Amador Chamber of Commerce. Later, in June, a number of schools in Tuolumne County were covered and a lecture given before the annual meeting of the Tuolumne County Chamber of Commerce.

During July the principal resorts in the Feather River region and all the important centers of population were reached. Two special programs were arranged for the benefit of the employees of two large lumber companies. The Plumas Sierra Fish and Game Protective Association sponsored the lectures.

Donald McLean has been trying hard to solve some of the problems connected with the relation of big game to agriculture. In Santa Cruz County he has had a difficult problem in attempting to protect gladioli gardens from deer. Numerous repellents were tried out with poor success in that deer are practically domesticated. A trip to Del Norte County showed that less damage was being done by the elk in the vicinity of Orick.

The less strenuous days of summer have given E. S. Cheney, official photographer, time to cut and assemble films. The new film on the little brown crane has attracted a great deal of attention. Several splendid additions have been made to the film on shore birds. Work this fall will be concentrated on making a two or three reel feature on "Division Activities."

On August 25, Paul A. Shaw left for the Bear River marshes in Utah to study conditions existing during the present outbreak of duck disease. Four days were spent on the marshes, in making field tests and conducting feeding experiments. A number of samples were collected for more detailed laboratory study. Valuable data for comparison with California conditions were obtained. The preliminary study that has been made indicates the probability of "alkali poisoning" as the cause of the sickness in this area. Conditions in this area reported much better than in August, chiefly as the result of scaring the birds out of the territory by frequent shooting.

Bureau of Game Refuges

Refuge 1-T consisting of about 2000 acres in Humboldt County, a new refuge, has been posted. This is in excellent game country, well stocked with quail and deer. There are also quite a number of grouse in its boundaries. The refuge is well bounded; a creek on the south; fences on the east and west, and high ridges on the north. It is all in one holding and as far as is known there were no objections to its creation.

Lion hunter Jay Bruce worked during the entire month of June in the headwaters of the Mokelumne River in Amador and Calaveras counties. He was successful in securing one adult female and three young lions. Bruce reports deer and game conditions as very good. Hunter C. W. Ledshaw secured two lions in Tuolumne County. H. L. Bevans, in Lake County, bagged four. During July, Bruce worked in Plumas County and Ledshaw was sent into Humboldt and Del Norte Counties.

In all there have been turned in for bounties, seventeen scalps for June, ten females and seven males. This brings the total number submitted for bounty during the first six months of the year to 203 and during the fiscal year 333. In the first six months of the past four years the record has been:

1926	-----	147
1927	-----	128
1928	-----	202
1929	-----	203

Bureau of Publicity

During the past three months, work of the publicity bureau has gained in the number of stories released, and the amount of space given to work of the division has also increased materially.

Stories on the need for securing deer tags, arrests for violation of fish and game laws, when the case was an aggravated one and the penalty imposed was heavy, came in for general publication. Details of the season's fish planting also were widely printed.

The director of the bureau assisted Mr. J. S. Hunter in arranging for the convention of the Western Association of Fish and Game Commissioners in San Francisco on August 23-24. Entertainment of the delegates was superintended, and the convention pronounced a success.

Service bulletins were issued each month, and field trips made to Monterey and Los Angeles, where publicity releases were issued regarding local conditions at Monterey and in southern California.

A summary of the work done indicates that the newspapers are taking more of the division stories than ever before, and are in most cases using the "copy" sent them without change.

Bureau of Hydraulics

In the early part of July, a submarine pipe line of the Associated Oil Company at Ventura broke, letting about 600 barrels of oil escape, which lodged on the beach north of Ventura. Portions of the beach were cleaned for a distance of nine miles. Request was made of the company to clean up and a large force of men, teams and trucks removed the beach sands that were covered with oil, with the result that no evidence of the break is now apparent. As a result further protective devices have been installed by the company on the submarine pipe and probably there will be no recurrence for some time to come. As far as known this is the first break in submarine oil lines for some years.

The Pacific Gas and Electric Company has installed a fishway on its intake dam on the South Fork of the American River above Placerville.

An injunction suit is pending in the Superior Court of Mono County to compel the Cain Irrigation Company to install fish screens and a fishway. A criminal action brought in the justice court at Bridgeport, for which the defendants asked a jury trial, resulted in a disagreement. The trial was on for three days.

Total fish screens operating to date is 111. Fishways in operation reported to be 66.

Two ladders have been repaired since the last report was filed.

Bureau of Game Farms

A census of the bird life of the state game farm at Yountville shows 29 different species made up of pheasants, partridges, quail, turkeys, ducks, doves, grouse and geese. At some time during the season most of these birds have laid eggs. However, we find the dependable egg producers to be as follows:

Pheasant—

Ring-necked-----	23,626
Silver-----	197
Golden-----	221
Amherst-----	22
Reeves-----	173
Turkey-----	328
Valley quail-----	749

A great deal of the food for birds at the game farm is raised on the farm. Superintendent Bade has a splendid garden, and raises lettuce, kale, tomatoes and

various other vegetables that go into the feed of the birds. Work in connection with the garden, as well as all of the construction work on new brooder houses, pens, and various other improvements is taken care of by the regular force at the farm.

Eugene D. Platt, who has been employed at the Yountville farm for two and a half years has been transferred to the new Los Serranos game farm which the division expects to have in operation very soon.

Thirty-seven Mexican bronze wild turkeys were hatched in an electric incubator and brooded for 30 days in an electric brooder. They are now out in the rearing pens and there are still 37 at this writing. Their development has been normal and they seem to be good birds in every way. At present they are further developed than other birds hatched earlier and brooded by domestic hens.

The results of hatches of pheasant eggs sent out to clubs and individuals show very well. Out of 360 eggs sent Salvatore Bilotti, foreman on the Fitzhugh Ranch, at McCloud, 282 birds were hatched. The same number of eggs sent to George N. Peltier, Westwood, Lassen County, produced 250 birds. Mr. Peltier says the sportsmen of his locality are more than pleased with their success. They also purchased 300 additional eggs from an Oregon breeder. Their plans for this next year are now being formed so that they can hatch and rear a large number. In all about 2000 eggs were sent out and the check up in most cases is satisfactory.

Bureau of Fish Rescue and Reclamation

Using one of the Division of Fish and Game fish cars for the purpose, a large number of bass have been planted in Lancaster Lakes in Los Angeles county. The fish for this planting were rescued by the Fish Rescue and Reclamation Bureau of the Division.

Holding bases near Elk Grove have been established for bass and other fish that are rescued from many areas in the state and at this point shipments will be made. Thousands of fish have been rescued this year, including black bass, crappie, bluegill and green sunfish, Sacramento and yellow or ring perch, calico bass, striped bass and catfish. These fish will be distributed to places where they will be able to thrive and be appreciated.

LIFE HISTORY NOTES

THE ANTELOPE OF LASSEN COUNTY

Probably the largest herd of pronghorned antelope in California range in Lassen County over some 1400 or 1500 square miles of tablelands and desert country. In winter this herd of antelope ranges inside of Game Refuge 1Q, with the exception of about 35 head which winter on the south side of Big Valley in the Windmill Flat section.

that they moved over on the California side to get away from the sheep. I do not believe that this is true because very reliable men who have ridden that range for the last forty years tell me that this herd of antelope never did range over into Nevada any great distance, except in case of a hard winter when deep snows force them into the desert of Nevada.



FIG. 112. Sagehen nest and eggs, Schaffer Mountain, Lassen County. Eggs were brought in and set to hatch under domestic hen to be sent later to State Game Farm for experimental purposes. Photograph by C. O. Fisher, April 28, 1929.

The antelope have shown a very marked increase during the last few seasons. During the season of 1928 I believe that the herd increased about 50 per cent, for during the season mentioned I thoroughly covered the antelope range and found to my surprise that with few exceptions all the does had twin fawns. The does and bucks seem to be about half and half on the range.

I have heard that this herd of antelope in years gone by ranged more in Nevada than they did in California and that the sheep grazed their range off so closely

About one-half of the herd migrate in the spring, about the middle of April, after having their young. Some of these antelope go as far west as Harvey and Grays valleys in Lassen County, which are about four or five miles from the Shasta County line. They must travel about seventy or eighty miles, going west in the spring and east in the fall. Just after the spring migration the bucks and does separate, later banding together about the first of November and migrating to the winter range, where they stay in large bands throughout the winter.

I believe that nearly all the fawns are born in Game Refuge 1Q, and this, I believe, is the only time that the sheep bother them. In the southern end of Game Refuge 1Q, known as Skedaddle Mountain section, a number of large bands of sheep lamb in the spring in the particular places where the young antelope are born. Prong-horned antelope seem to be well able to protect themselves and their young from coyotes and other predatory animals.

Very seldom is an antelope killed by violators, as it is understood that the fine will be \$500 or more. A few have been killed by hunters sneaking in through the back door from Nevada and a few by fly-by-night travelers passing through from

THE ANTELOPE NEAR FRESNO

In the winter of the year 1878 my husband and I came to Washington Colony, six miles south of Fresno, as bride and groom to establish our home.

As soon as the warm days of spring came on, the antelope came in from the river bottoms seeking food and seemingly in a period of migration.

The following year, 1879, the construction of the Church canals was started. As soon as the water in the canals was ready for distribution the colonists planted alfalfa. This furnished a real treat for the antelope. They came in hordes, from forty to fifty in a band. All night long they fed on the alfalfa. The first alfalfa was cleaned off by these lovely

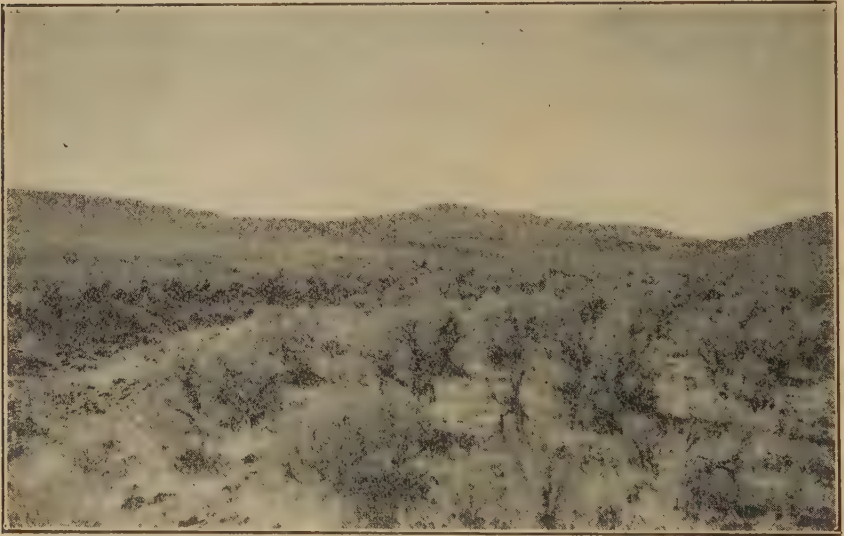


FIG. 113. Antelope and sagehen range looking south to Skedaddle Peak in Game Refuge 1Q. Photograph by E. S. Cheney.

Klamath Falls, Oregon, going to Reno, Nevada.

The ranchers living in the antelope country, as well as the cowboys that ride that range, are cooperating in protecting antelope. Any number of incidents can be cited showing that residents in the antelope country are cooperating in protecting the animals. Antelope are unlike many of our game animals, for they cause no damage to the farmer, but years ago the sheepmen killed great numbers of antelope in order to save the feed on the range for their sheep.—C. O. FISHER, Susanville, California.

creatures. During the day they sought the shade of the north banks of the canals. Here they slept until the next evening, and then back to the alfalfa fields. These harmless, graceful animals were not wild. The settlers never abused them, even though they were destructive to the alfalfa and vegetables of the early pioneers.

The coyotes were the worst enemies of the antelope. However, a full-grown antelope could easily outrun a coyote. Occasionally a stranger might try to shoot an antelope, but the colonists soon let it be known that the antelope were not

game. Sheep could be bought for \$1 a piece, so it was not necessary to have antelope for food.

To save the alfalfa it was necessary to drive the antelope off, so dogs were trained to drive them away. One day a little lamb, too small to follow the herd, was left in the alfalfa. My husband and I found the little thing and brought it to the house. We fed it milk from a bottle and it grew to be of good size. It was very tame and romped around with our dogs. At night we opened our door, and it came in to snuggle down in its little box behind the kitchen stove.

A very large strange dog attacked our pet one day and killed it. It had never known the fear of dogs, and, for this reason, it made no attempt to run from this savage marauder.

As the country was settled and the land was planted, the antelope gradually disappeared. Strays were seen around us for about five years along the edges of the colonies around Fresno. In later years, in crossing the plains, we saw herds of them near Firebaugh. I noticed the antelope we saw there were not the gentle pets we had known. They were very wild and we could see them only in the distance. Hunters had taught them to fear mankind. Gradually they left the floor of the valley and sought refuge in the foothills of the coast range. About twenty-five years ago my son spent some time in the foothills of the coast range. A herd of about fifty antelope was sighted near the mouth of Salt Creek, near Panoche Pass and around the Joaquin Murrietta country.

We had many interesting experiences with the gentle creatures. They were playful, tame and harmless, except to vegetation. They were beautiful sights in the moonlight, their white rumps showing a silver line as they raced across the plains. Our acquaintance with them in our daily life helped to break the monotony of our loneliness. The younger generation today little appreciates the affection we, as early settlers, felt for our graceful fleet-footed friends of the early days.—MRS. HENRY LARSEN, Route 5, Box 121, Fresno, California, May 13, 1929.

TUNA SEEN OFF VANCOUVER, B. C.

We are indebted to C. B. Tendick of the U. S. Bureau of Fisheries for a memorandum of the occurrence of tuna off Vancouver Island. On the morning of June 4, 1929, the first mate of the steamer *Ixion* observed some fifteen or twenty groups of tuna consisting of four or five fish each. This was just off the entrance

to the Strait of Juan de Fuca. Fish were observed during a period of two and one-half hours, but the species could not be told except that the tuna seemed too large to be albacore.

There have been occasional reports of tuna having been caught off Cape Flattery and the west coast of Vancouver Island, and the secretary of the Seattle Halibut Exchange informed Mr. Tendick that tuna were occasionally delivered by halibut fishermen and that two or three such fish were delivered in September or October of 1928. Other markets in the Vancouver and Seattle regions have reported an occasional delivery but have been unable to identify the species of tuna.

The *Pacific Fisherman* of August, 1915, reported on page 14 "a tuna" four feet long and weighing about thirty pounds, which was caught during the early part of July, 1915, in a trap on the west beach of Whidby Island, Puget Sound.—W. L. SCOFIELD, Terminal, California, July 5, 1929.

BIG-EYED BASS (*XENISTIUS CALIFORNIENSIS*) AND DOLPHIN (*CORYPHAENA HIPPURUS*) CAUGHT OFF SAN PEDRO.

During the month of August, 1929, two species of fish found in warmer seas but uncommon in the waters off San Pedro, have been landed at this port. On August 21, one hundred pounds of big-eyed bass, *Xenistius californiensis*, were taken off Point San Juan. This fish is rather common in Mexican waters and at times is reported in some abundance off San Diego, but is rare in the San Pedro region.

The dolphin, *Coryphaena hippurus*, normally a frequenter of more southern waters, has also been taken in some numbers in the San Pedro area. On August 16, between three and four hundred pounds were caught in local waters and landed at San Pedro. Again on August 22, about one hundred pounds of this species were caught off Oceanside, and delivered to the San Pedro markets.—FRANCES N. CLARK, California State Fisheries Laboratory, Terminal, California, August 23, 1929.

A RACIAL COMPARISON OF CALIFORNIA, HAWAIIAN AND JAPANESE ALBACORE (*GERMO GERMO*).

During July and August, 1929, a preliminary study of possible racial differences between California, Hawaiian and Japanese albacore was made by the California State Fisheries Laboratory. Since fish from these localities were delivered to the canneries at Los Angeles

Harbor during the summer months, an unusual opportunity was offered for the study of racial characters of the albacore from these three, distant regions. Speculation has been rife concerning the albacore population of the Pacific. Scientists at present are agreed that albacore from Japan, Hawaii and California all belong to the same genus and species, *Germo germo*. This throws no light, however, on the question of local races or of a possible mixture of populations. With the hope of contributing some facts to the solution of this problem, this study was undertaken.

The limitation of available time and the detail required by such a study confined the observations to twenty California, thirty Japanese and twenty-one Hawaiian fish. Such small numbers preclude the possibility of drawing definite conclusions, but indicate lines along which future work can be conducted. With this purpose in view, this brief report has been drawn up.

All measurements on Japanese and Hawaiian albacore were made at the cannery of the Coast Fishing Company at Wilmington. The extreme courtesy of the employees of this company, and especially of Mr. E. H. V. Avery and Mr. Stanley Livingston in giving the laboratory notice when fish were received, rendered the work much less difficult. The California fish were measured at various canneries at Fish Harbor, San Pedro. In the study, fourteen measurements were made on each fish to ascertain whether or not the body proportions, such as length of head or depth of body, differed for fish from the three localities. Counts were also made of the number of rays in the dorsal, anal and pectoral fins and of the number of gill rakers on the lower arm of the first gill arch. Such characters are frequently influenced by the environment which surrounds the egg and larval life of a fish population. If albacore from California undergo the early period of their development in different surroundings than fish from Hawaii, the number of rays in the fins would presumably differ between individuals from these two localities. The above measurements and counts were made by the writer and recorded by other members of the laboratory staff.

The most striking difference between Hawaiian, Japanese and California albacore was the range in size. California fish were the smallest of the three, Hawaiian the largest, and the Japanese about midway between the other two. For the fish measured, the California albacore ranged from twenty-nine to thirty-

five inches in length from the tip of the snout to the middle rays of the tail; Japanese, from thirty-four to thirty-eight inches; and the Hawaiian, from thirty-nine to forty-six inches. These sizes refer only to albacore delivered in California from Japan and Hawaii. Whether or not they represent the range in size of all fish found in these localities is doubtful since a publication by Kishinouye (Journ. Coll. Agr. Tokyo, Vol. 8, p. 434-437, 1923) indicates that smaller sizes at least are taken in Japan.

Again the state of maturity of the sex organs differed for the Hawaiian fish as compared with those from the other two regions. All of the Hawaiian albacore examined were practically mature and ready to spawn, while the fish from both Japan and California showed no indication of an approach toward a ripe condition.

Because of the discrepancy in size-range, no adequate measure could be made of the differences in body proportions for the fish from the three localities. Since the relative body proportions change for individuals with an increase in length, body proportions can be directly compared only for fish of approximately equal lengths. Such material was not available in this study. The relative body proportion measurements for the Japanese albacore did, however, occupy an intermediate position between those for California and Hawaii. This is the result that would be expected if the fish had all come from the same population, since the size of the Japanese fish was intermediate between the other two.

Fin ray and gill raker counts are more satisfactory for racial studies as these numbers apparently do not change with increase in size. For this reason statistical measures of the reliability of the results can be applied. In this study, no certain differences could be determined for the fin ray and gill raker counts between albacore from California and Hawaii, or between fish from Japan and Hawaii. On the other hand, the differences between California and Japanese fish must be considered valid according to the usual measures of reliability. However, differences between two groups of California fish were greater than the differences between all the California and the Japanese fish. This throws the usual measures of reliability of a result open to question as applied to these figures, and we are forced to conclude that more data are necessary to demonstrate positively the presence or absence of racial differences between California, Hawaiian and Japa-

nese albacore. Future racial studies should stress, therefore, the accumulation of information on the number of fin rays in fish from the three regions, since these

data at present give the greatest promise of fruitful results.—FRANCES N. CLARK, California State Fisheries Laboratory, Terminal, California, August, 1929.

COMMERCIAL FISHERY NOTES

N. B. SCOFIELD, Editor

NEW PATROL BOAT PLANNED

Preliminary plans and specifications have been drawn up for a new fisheries patrol boat for southern California to take the place of the *Albacore*, which will be transferred to northern California. This is necessary on account of the rapid expansion of the commercial fisheries. The new boat will be used for both patrol work and scientific research work of the State Fisheries Laboratory. It is hoped this new boat will be completed and in service within the next six months.

ALBACORE AT SAN DIEGO

On account of the albacore run showing up at San Diego, there was somewhat of a stimulus in license sales both at the San Diego and Terminal offices. The deputies have been kept busy in the southern section overhauling boats for licenses and boat registrations. On hearing of the albacore run at San Diego a number of Monterey salmon fishermen went down to try their luck on albacore.

The first albacore was taken off San Diego on July 4. The catch throughout the month was light, however, 700 to 800 pounds being high boat for the day's catch. The fish average in weight from 17 to 18 pounds. The price to the fishermen has been \$300 per ton.

BIBLIOGRAPHIES

As the published literature is rather extensive for certain fisheries, it is a large task for each staff member to work up a bibliography that is reasonably complete. We consider that the one who is in charge of the library should be familiar with the research work of each staff member and should assist each worker by calling his attention to current publications of significance, and also by compiling general bibliographies to cover the subject as a whole. Each piece of work naturally should include a special bibliography compiled by the worker himself. Such requirements in library work necessitate a zoologist rather than a librarian. We have, fortunately, a trained and capable zoologist in Miss Genevieve Corwin. She has during the past year, in addition to routine library work, prepared for publication an extensive list of

references to the tuna, the industries, methods, and gear, as well as investigations concerned with the tuna. This we expect to have published this fall. In addition, Miss Corwin is now preparing a similar bibliography for sardines. Each of these is to be catalogued separately as to author, title and subject matter. Her next work will probably cover the mackerel fishery.—W. L. S.

SARDINE SEASON OPENS

Thirteen established canneries began operation at Monterey on August 1.

Two new canneries which will operate this year are, the Custom House Packing Corporation and the Monterey Sardine Products Company, both new companies with the latest in modern and sanitary equipment.

Most of the canners have abandoned the fry pack and will pack with the pre-cooked raw method, which eliminates, in some cases, the dryers as well as the fryers. Some packers will continue with the fry pack, but have made vast improvements in methods and expect to turn out a fine product.

This season looks to be one of great promise. With a new law in effect the canners were well organized, started operations August 1st, and sardines seemed to take the center of the fishing industry stage. The Division of Fish and Game is vitally interested in a successful canning season on sardines and particularly in the improvements, which should assure a fine pack and do much to popularize the California sardine throughout the world.

NEW PUBLICATIONS

Three types of publications dealing with commercial fisheries have been tentatively agreed upon:

1. A series of annual bulletins presenting the catch figures in popular form as well as in tables of monthly catch. This has the merit of presenting the otherwise unpublished monthly figures.

2. A bulletin establishing official common names and presenting photographs with brief descriptions of each commercial species.

3. A series of articles and bulletins describing each fishery as to gear used, methods employed, and history of the development of the industry. Such work on a fishery is a necessary accompaniment to a boat catch analysis, and in addition, creates more general interest in our fisheries.

Some five publications are in course of preparation or are nearly ready for printing. A report covering the drag net fishery; the sardine fishery at Monterey; white sea bass; southern halibut, and barracuda. In addition, the mackerel fishery will be described and this work pushed to early completion.

THE TUNA FISHERY IN WESTERN SPANISH SAHARA

Liberal Translation from the Spanish¹

"Under the above title the *Vasconia Industrial y Pesquera* publishes a very interesting article by Don José Masqueira Manso. It refers to the tuna, or, at least, to a species very similar to it.

"The tuna lives widely dispersed throughout its geographical range when it is pursuing prey, and during the time of its active feeding its voracity permits of its being caught with a hook. At spawning time it congregates in great schools, because all of the mature (ripe) individuals are looking for the best location, where the temperature of about 20 degrees will permit them to effect fertilization.

"In Atlantic waters a spawning area has been discovered off the coasts of Cádiz; in the western Mediterranean, which is bounded by Africa on the south, and on the west by the coasts of Spain, France and Italy, the breeding area lies between Sicily, Cerdeña and Tunis. Both districts are suitable for 'Almadrabas' or giant tuna traps.

"The tuna which go to spawn in front of Cádiz and which our gear catches, when they disappear, where do they go? Large specimens are taken along Cantabria and even as far north as the coasts of Norway. But we see, as Señor Masqueira points out, that the fish average in weight about 40 kilos, which does not agree with the average size of the tuna caught in the traps of the south of Spain—which exceeds 100 kilograms each.

"We select the most noteworthy paragraphs of the article:

"During the last few years—it is only recently that the Spanish trawl-craft have gone below the latitude of Cape Judy—great quantities of tuna have been found on the hake banks between the parallels

of 24 degrees and 27 degrees, north latitude, at depths ranging between 100 and 400 fathoms.

"The crews of these trawlers have noticed that on lifting their drag nets the tuna gathered astern of them in great schools, devouring the fishes that escaped through the mesh of the trawls, and manifesting a distinct predilection for jurel and red sea bream.

"It was decided to fish for the tuna, but to do so with trolling tackle, such as is used for bonito and albacore, was not feasible, owing to their size. Then someone conceived of an apparatus composed of the following: A sisal rope 14 to 16 millimeters in diameter, a tough wire leader, a strong hook having an eyed shank, and a pole. One end of the rope is made fast aboard; to the other end the wire leader is bent on, the leader terminating in the hook.

"When the apparatus has been prepared in the manner described, a lashing or loop of twine is bent on about one fathom from the hook. Ready, now, to fish, the loop is rigged to the small end of the pole with which are commenced movements sufficiently rapid, up and down, the baited hook entering and leaving the water in such a way that the tuna fails to discern the deception, and is hooked. Once hooked it is natural that he commences flight, and this movement bends the pole and unships the loop. The hook is baited with a red bream, which are taken abundantly by the trawls. The hook is of ordinary form, having a shank 10 centimeters long and an opening of 5 centimeters. The steel stock from which these hooks are made is of 8 to 10 millimeters in diameter.

"In that area of sea comprised between the 24th and 27th parallels of north latitude and the 14th and 17th meridians of west longitude, the Spanish trawlers are at present catching tuna. Last November several small sailing vessels from the Canary Islands were fishing tuna along the 24th parallel in less than 50 fathoms. They transferred the fish that they caught to another vessel of larger tonnage which lay anchored near them; there the catch was sailed.

"The tuna begin to appear in July—in some years, during the last fortnight of June—and disappear in January, or during the first two weeks of February."—GEO. ROGER CHUTE, California State Fisheries Laboratory, Terminal, California.

PURSE SEINE BOATS

In the past the cannerymen at Monterey have had to depend on lampara fishermen for their supply of sardines. It has not been practical to use purse seine boats as

¹ Boletín de Pesca (issue of April, 1927, p. 108), published by the Spanish Institute of Oceanography, Alcalá 31, Madrid.

it is not safe for them to unload at the canneries which are located on the rocky shore. Two or three seasons ago the K. Hovden Company employed two small purse seine boats. To do away with the danger of unloading, experiments have been made with a suction unloading tube which enables the boat to unload some distance off shore. This method has been quite successful. This season there will be thirteen or fourteen purse seine boats, and possibly more, operated at Monterey. The lampara fishermen claim the purse seines destroy hundreds of tons of sardines which they can not deliver to the canneries. They claim they often get a catch of sardines which is double the capacity of their boat, and the surplus sardines which are turned loose are all dead.

Last season, Paul Bonnot of the Division, made a special investigation of the operations of the two purse seine boats at Monterey. It is evident from this investigation that the purse seines have on occasion destroyed more sardines than they could take on their boats. Mr. Bonnot is convinced, however, that this loss is due more to the lack of care by the fishermen than to the type of net used, and that the opposition to the nets is the old prejudice that manifests itself when any improved method is developed that

temporarily throws men out of employment. The lampara net may be just as destructive, in proportion to its size, as a purse seine.

Trouble is likely to develop between these two types of fishermen this season. Already there is talk of a general strike of lampara fishermen, and the canners say they will put in suction unloading tubes and employ purse seines exclusively, if the threatened strike develops.

UNLOADING OF SARDINES SIMPLIFIED

A brand new method of bringing fish into a cannery has been developed at Monterey by one of the leading packers of sardines, and has been adopted by five others. Sardines will be unloaded from the fishing boats by suction, through an eight-inch pipe, a powerful pump supplying the motive power. The force of the salt water driving the fish through the pipe will remove the scales and when the sardines arrive in the cannery, they will be ready for cutting, and putting into cans. Thus time will be saved, fish will be saved, and the expense of a scaling machine will be eliminated. A suction system of this exact type has never been used for this purpose before, but elaborate tests have shown that it works, and that it will provide for greater efficiency and speed in the canning of sardines.

STATEMENT OF INCOME

For the Period July 1, 1928, to June 30, 1929, of the Eightieth Fiscal Year

License sales:	Detail	Total
Angling, 1927-----	\$1,040 00	
Angling, 1928-----	370,314 20	
Angling, 1929-----	73,903 00	
Hunting, 1928-----	461,412 50	
Hunting, 1929-----	40,339 00	
Market fishermen's licenses, 1928-1929-----	31,320 00	
Wholesale fish packers' and shell fish dealers', 1928-29-----	990 00	
Game breeders' licenses, 1928-----	102 50	
Game breeders' licenses, 1929-----	717 50	
Fish breeders' licenses, 1928-----	33 00	
Fish breeders' licenses, 1929-----	333 00	
Trapping licenses, 1928-1929-----	6,479 00	
Commercial hunting club, 1928-1929-----	2,025 00	
Commercial hunting club operators', 1928-1929-----	575 00	
Deer tag licenses, 1928-----	105,634 80	
Kelp licenses, 1929-----	10 00	
Market fishermen's licenses, 1929-1930-----	30,970 00	
Commercial hunting club licenses, 1929-1930-----	25 00	
Total license sales-----		\$1,126,297 50
Other income:		
Game tag sales-----	\$37 56	
Court fines-----	86,780 28	
Fish packers' tax-----	175,805 85	
Kelp tax-----	50 28	
Fish tag sales-----	7,047 63	
Crawfish inspection-----	21 00	
Miscellaneous sales-----	699 89	
Interest on bank deposits-----	5,170 21	
Contributions from importers-----	407 18	
Total other income-----		276,019 88
Total departmental income-----		\$1,402,317 38

STATEMENT OF EXPENDITURES
For the Period July 1, 1928, to June 30, 1929

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Administration:					
Executive and legal	\$16,109 99	\$2 90	\$3,114 19	\$571 65	\$19,798 73
Clerical and office	23,475 03	1,234 83	5,286 83	580 10	30,576 79
Rent			9,045 88		9,045 88
Automobiles		289 70	356 44		646 14
Telephone and telegraph			5,006 57		5,006 57
Postage			4,121 66		4,121 66
Freight, cartage and express			2,210 23		2,210 23
Printing		12,189 80			12,189 80
Accident and death claims			8,425 43		8,425 43
Commissioners			637 12		637 12
Total administration	\$39,585 02	\$13,717 23	\$38,204 35	\$1,151 75	\$92,658 35
Education:					
Director and assistants	\$13,932 56	\$688 94	\$3,851 92	\$2,418 22	\$20,891 64
Pacific southwest exposition	248 75	1,014 06	1,349 13		2,611 94
Total education	\$14,181 31	\$1,703 00	\$5,201 05	\$2,418 22	\$23,503 58
Publicity:					
Director	\$3,300 00		\$693 14		\$3,993 14
State fair	357 00	\$212 21	730 71		1,299 92
Total publicity	\$3,657 00	\$212 21	\$1,423 85		\$5,293 06
Conservation and protection:					
Chief and assistants	\$10,700 02	\$39 55	\$2,233 84		\$12,973 41
Clerical and office	2,875 00	66 86		\$10 50	2,952 36
Rent			381 19		381 19
Automobiles		993 58	615 30	6,474 02	8,082 90
Captains and deputies	211,017 26	254 08	156,513 32	840 46	368,625 12
Patrol launches	2,085 00	1,591 73	1,807 11	488 61	5,972 45
Lion hunters	3,968 69				3,968 69
Coyote trappers	358 88				358 88
Lion bounties			8,500 00		8,500 00
Fish planting	1,385 00	1,016 75	2,324 51		4,726 26
Refuge posting	6,111 78	366 19	1,246 32	35 78	7,760 07
Fish reclamation and rescue	505 00		458 22		963 22
Total conservation & prot.	\$239,006 63	\$4,328 74	\$174,979 81	\$7,849 37	\$425,264 55
Commercial fisheries:					
Chief and assistants	\$9,691 34	\$798 07	\$2,197 21	\$499 71	\$13,186 33
Deputies	32,751 77	110 17	9,141 52	65 53	42,068 99
Patrol launches	3,321 45	2,378 46	2,290 04	97 48	8,087 43
Statistical	7,395 00	240 40	744 40		8,379 80
Laboratory	35,954 06	1,567 51	7,172 44	958 41	45,652 42
Salmon tagging		224 34	41 00		265 34
Botulism			15,000 00		15,000 00
Automobiles		491 23	301 17		792 40
Carp eradication	1,485 84	315 10	240 35		2,041 29
Biological sur. of Monterey By.			1,500 00		1,500 00
Total commercial fisheries	\$90,599 46	\$6,125 28	\$38,628 13	\$1,621 13	\$136,974 00
Fish culture:					
Chief and assistants	\$4,730 00	\$8 18	\$469 87	\$26 50	\$5,234 55
Clerical and office	3,290 67	82 48	314 43	153 65	4,541 23
Rent			105 00		105 00
Automobiles		3,564 53	1,658 21	52 55	5,275 29
Hatcheries	12,878 31	62,853 37	18,597 89	7,168 63	217,498 20
Hatcheries—Add'ns. & Bett'ms.				2,070 02	2,070 02
Special field investigations	9,060 00	1 50	3,716 06	7 18	12,784 74
Fish reclamation and rescue	3,271 00	327 31	1,126 13	176 87	4,901 31
Total fish culture	\$149,929 98	\$66,837 37	\$25,987 59	\$9,655 40	\$252,410 34
Hydraulics:					
Chief and assistants	\$5,790 00	\$441 60	\$2,039 34	\$176 72	\$8,447 66
Cooperative research work	2,704 33		137 90		2,842 23
Total hydraulics	\$8,494 33	\$441 60	\$2,177 24	\$176 72	\$11,289 89
Game propagation:					
Game farm—Yountville	\$9,546 44	\$8,527 84	\$3,012 93	\$2,097 44	\$23,184 65
Automobiles		151 37	69 46		220 83
So. California game farm			4 80		4 80
So. Cal. game farm—Additions and betterments				1,954 18	1,954 18
Total game propagation	\$9,546 44	\$8,679 21	\$3,087 19	\$4,051 62	\$25,364 46
Research:					
Chief and assistants	\$11,435 03	\$592 72	\$1,595 63	\$70 00	\$13,693 38
License commissions			55,291 48		55,291 48
Hungarian partridges				5,678 30	5,678 30
Salinas River channel				98 37	98 37
Total eightieth fiscal year	\$566,435 20	\$102,637 36	\$345,676 32	\$32,770 88	\$1,047,519 76
Prior year					5,418 61
Grand total					\$1,052,938 37

Smelt.....	32,959	6,988			908	31,829	41,785	16,814
Sole.....	2,024				10	2,304,136	269,918	53,367
Spittail.....		17			61,224	9,869		
Striped Bass.....								
Swordfish.....								
Tomcod.....								
Tuna—Bluefin.....						5,522		
Tuna—Yellowfin.....								
Turbot.....								
Whitebait.....		598						
Whitfish.....	71,196	155				50,464	30	7,689
Yellowtail.....								
Miscellaneous.....	23				70	9,243	1,279	2,551
Total fish.....	806,337	27,928	245,849	313,940	1,313,990	4,125,484	863,199	1,374,836
Crustaceans:								
Crabs.....								
Shrimps.....	24,912	487,887				252,120	44,080	24
Spiny Lobsters.....						149,108		
Mollusks:								
Abalones.....								
Clams—Cockle.....		16,463						1,052,595
Clams—Mixed.....		221						
Clams—Pismo.....	1,544							1,504
Clams—Softshell.....		19,234			8,910	1,738		
Cuttlefish.....						4,858	362	25,871
Mussels.....	2,272					813	100	
Oysters—Eastern.....		41,414				27,885		2,781
Oysters—Native.....		22,434				445	9,389	3,241,105
Squid.....								
Miscellaneous:								
Turtles.....								
Totals.....	832,793	615,581	245,849	313,940	1,322,900	4,562,451	877,030	5,698,816

1 1038 dozen.
 2 188,248 shell oysters.
 3 10,505 dozen.
 4 126,750 shell oysters.
 5 170 dozen.
 6 1 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF APRIL, MAY AND JUNE, 1929

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Fish from south of the International Boundary brought into California via San Pedro	Fish from south of the International Boundary brought into California via San Diego	Total fish from south of the International Boundary brought into California
Anchovies		36,347	300		159,638			
Barbauda	383	1,655,424	85,046	446,001	2,186,864		19,650	79,350
Bonito		54,761	3,154	120,655	178,560			
Carp					19,885			
Catfish					127,043			
Cultus Cod	194		659		180,120			
Flounders		360	321		172,229			
Grayfish	185	57,056	357	22,921	167,801			
Hake					100,659			
Halibut	58,604	129,345	6,805	18,310	403,140	6,903	61,907	68,810
Herring					14,221			
Kingfish		98,096	486	218	155,482			
Mackrel	24	10,937,109	1,032,533	3,606,925	15,601,412			
Mackrel—Horse		39,619	617		45,649			
Mullet		3,461			14,203			
Perch	5,370	19,547		10,742	91,334	2,320	7,227	9,547
Pike				6	746			
Pompano		1,358		217	2,044	1,642	1,830	3,472
Rock Bass	829	52,157	24,652	47,481	125,119	4,079	4,513	8,592
Rockfish	26,475	350,270	8,131	485,213	1,390,520		1,690	1,690
Sablefish		190	665		323,356			
Salmon					1,501,742			
Sandbabe		4,347	138		49,120			
Sardines		12,244,394		317,767	13,140,968			
Scupin	14	25,948	321	5,566	32,389			
Sea Bass—Black			2,691	30,901	39,000	3,106	40,554	43,660
Sea Bass—White	6,867	183,519	9,452	78,165	278,122	69,900	36,318	106,218
Shad					29,499			
Shad—Buck					605,885			
Shad—Roe					912,989			
Sheepshead	2,690	29,959	654	533	33,836			
Skates		1,649	92	373	147,774			
Skipjack					933,901		1,417,116	2,351,017

Smelt.....	17,809	107,833	10	2,044	258,979		
Sole.....	42,944	1,348	800	1,002	2,716,372		
Solittail.....					110		
Striped Bass.....					142,837		
Swordfish.....					130,995		
Tomcod.....		4,578		126,117	5,522		
Tuna—Bluefin.....					3,266,795		
Tuna—Yellowfin.....		2,568,683		698,112	4,555,008	4,621,279	9,174,287
Turbot.....					598		
Whitebait.....					149,080		
Whitefish.....	277	22,645		28,427	51,349	287	287
Yellowtail.....		30,843	225	78,550	109,618	29,745	94,838
Miscellaneous.....		36,935	711		51,901	67,861	73,231
Total fish.....	162,890	28,702,894	1,178,910	6,126,226	45,495,174	6,309,977	12,014,999
Crustaceans:							
Crabs.....					728,136		
Shrimps.....					636,995		
Spiny Lobsters.....						114,948	114,948
Mollusks:							
Abalones.....	8,445				1,069,441	413,294	413,294
Clams—Cockle.....		3,138			19,601		
Clams—Mixed.....					1,765		
Clams—Pismo.....	24,236				25,740		
Clams—Softshell.....					29,882		
Cuttlefish.....					33,963		
Mussels.....					913		
Oysters—Eastern.....					869,299		
Oysters—Native.....					25,215		
Squid.....					3,250,339		
Miscellaneous:							
Turtles.....						2,158	2,158
Totals.....	195,571	28,706,032	1,178,910	6,126,226	50,939,463	6,427,083	12,545,399

CORRECTION

In the California Fresh Fishery Products Report for the months of January, February and March, 1929, which appeared on page 296 of *California Fish and Game* for July, 1929, Vol. 15, No. 3, the sardine catch at Monterey should read 99,405,081 pounds. This addition of 1,315,626 pounds should also be added to the total sardine catch and to the totals for Monterey District and for the state.

⁷ 11714 dozen.
⁸ 314,998 shell oysters.

SEIZURES OF FISH AND GAME

April, May, June, 1929

Abalone	pounds	1193
Barracuda	pounds	6505
Bass, black		185
Bass, striped		253
Bass, striped	pounds	68
Bluegill, perch, crappie		973
Catfish	pounds	424
Clams		2450
Crabs		301
Grunion		182
Halibut	pounds	270
Lobsters	pounds	471
Salmon		11
Sturgeon	pounds	83
Trout		592
Trout	pounds	107
Deer		2
Deer meat	pounds	562
Doves		3
Ducks		25
Mudhens		1
Nongame birds		42
Pheasants		1
Pigeons		3
Quail		20
Rabbits		62
Shorebirds		3
Set lines		1

GAME CASES

April, May, June, 1929

	Number arrests	Fines imposed	Jail sentences (days)
Violations of Hunting License Act	15	\$280 00	--
Deer; closed season	17	1,000 00	--
Quail; closed season	7	725 00	40
Nongame birds; killing of	9	185 00	--
Snipe, plover; closed season	1	75 00	--
Pigeons; closed season	1	25 00	--
Mudhens; closed season	4	40 00	--
Rabbits; closed season	15	470 00	--
Doves; closed season	2	100 00	--
Pheasants; closed season	1	--	160
Night shooting	2	25 00	--
Firearms in game refuge	4	25 00	--
Trapping License Act	3	20 00	--
Shooting from automobile	2	40 00	--
Bird nets; possession of	1	50 00	--
Totals	84	\$3,060 00	200

FISH CASES

April, May, June, 1929

	Number arrests	Fines imposed	Jail sentences (days)
Violations of Angling License Act	99	\$1,642 00	7
Trout; closed season; selling of	71	1,829 00	1
Clams; undersize; overlimit	49	1,301 00	45
Striped bass; undersize; overlimit	32	1,175 00	25
Abalones; undersize; overlimit	123	3,288 00	--
Sunfish, crappie; overlimit	14	370 00	--
Black bass; small	27	540 00	--
Crabs; small; female	12	350 00	--
Catfish; closed season	1	25 00	--
Lobsters; closed season	1	50 00	--
Barracuda; small	10	175 00	10
Small fish	1	25 00	--
Illegal nets; set lines	33	2,210 00	--
Violations of Commercial Fishing License Act	20	1,090 00	60
Pollution	3	200 00	--
Night fishing	11	410 00	--
Illegal fishing apparatus	8	200 00	--
Perch; overlimit	5	95 00	--
Grunion; closed season	15	155 00	--
Salmon; overlimit	6	575 00	--
Sturgeon; closed season	1	50 00	--
Eels; small	1	25 00	--
Fishing too near fish ladder	4	50 00	--
Shad; selling of in closed season	1	50 00	--
Totals	548	\$15,880 00	148

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